



Image of Saddlescombe Farm
by Mairi Eyres



Management and Restoration of Calcareous Grasslands

Rapid Review



Calcareous grasslands are unique ecosystems found on shallow, lime-rich soils. They include both chalk grasslands, found exclusively in northwestern Europe (with a significant proportion in southern England extending to the Yorkshire Wolds), and limestone grasslands, more widely distributed in areas such as the Cotswolds, Mendips and the Yorkshire Dales but they can also occur on base rich rocks like shale and dolerites.

Types of Calcareous Grassland Habitats

Understanding the different types of calcareous grasslands is crucial for effective management and restoration. The UK Habitat project categorizes calcareous grasslands into three sub-habitats.

1

Lowland Calcareous Grasslands: Found below 300m elevation, with a pH above 6.5 and meeting specific species criteria. These include some of the UK's oldest grasslands, covering 38,687 hectares of the UK.

2

Upland Calcareous Grasslands: Found above 300m elevation, with a pH above 6.5 and meeting specific species criteria. Resulting mainly from prehistoric woodland clearance and livestock grazing, they cover 20,000 hectares of the UK

3

Other Calcareous Grasslands: Grasslands with a pH above 6.5 that do not meet the strict species criteria.

Calcareous grasslands have the potential to support high plant diversity (up to 40 species per square metre) and unique invertebrate populations, and in association with scrub, provide critical habitats for declining bird species and small mammals. However, they are increasingly rare, with many areas now in a degraded state; these are now classified as modified grassland.



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The Key Challenges

Managing calcareous grasslands will often present farmers with several challenges that need to be addressed but the management required to improve the biodiversity and ecological integrity is very context dependent.

1 Land Use Change

The widespread conversion to arable production through ploughing and agricultural improvement through using fertiliser and herbicides have been the main drivers for calcareous grassland loss with the result that many of those remaining are small, on steep slopes and now of a fragmented distribution. Quarrying, housing and landfill sites have also caused localised losses.

High diversity calcareous grasslands would originally have been grazed by ponies and aurochs and in more recent history by sheep, cattle and significant wild rabbit populations. The loss of grassland to arable (with considerable change experienced post-EU accession in 1973) and the demise of mixed farms has also created a challenge in sourcing livestock for grazing many of the remaining calcareous grasslands, which can be small, relatively remote from farm infrastructure and isolated from other grassland. Without grazing, these grasslands are invaded by bramble and other scrub, eventually resulting in the loss of grassland flora and fauna.

2 Nutrient Enrichment

Elevated nutrient levels in the soil from historic agricultural fertilization (FYM and artificial), atmospheric nitrogen deposition, supplementary feed system wastage in fields and nutrient runoff from neighbouring areas all hinder calcareous species that favour nutrient poor soils.

3 Seed Bank Limitations

Chronically degraded calcareous grasslands can lack diverse seed banks especially in highly fragmented landscapes where grasslands are relatively isolated from one another, reducing opportunities for recolonisation of flora via seed dispersal. In addition, most grassland flora species produce large seeds which are not wind dispersed, with orchids and dandelion-like plants being one of the exceptions.

Management Strategies to Aid in Restoration

An ecological audit (what is there and/or what potential for restoration is there?) and initial site management statement (setting out objectives and a framework for management) is a starting point for restoring a degraded example. In terms of restoring or re-creating this habitat on arable or agriculturally improved grassland, local nature and landscape recovery strategies can be consulted as they will have identified the locations where restoration of high nature value habitats, such as calcareous grasslands (CG), are a priority and are most likely to be successful (and grant aided through SFI or stewardship). Cluster groups are well placed to help farmers work together and gain funding for successful projects.

1. Grazing and Grassland Management

Calcareous grasslands should at their healthiest consist of a sward dominated by herbaceous flowering plants, with fine-leaved grasses and sedges in the matrix. The majority of herbs are perennial and rely upon sunlight reaching them in early spring to enable their ground-hugging basal leaves to photosynthesise and 'fuel' spring and summer plant growth. This is important in implementing correct management. To benefit the grassland flora, the turf needs to be closely grazed and be short by early spring. This is often achieved by grazing in winter through March. But, in understanding the correct management for your grassland, a knowledge of what is important there in terms of flora and fauna is necessary and input from a grassland ecologist is advised. For larger examples, a diversity of grassland heights, with scattered scrub and small areas of bare ground will provide for the diversity of flora and fauna likely to be present while noting that some insects, such as the Adonis Blue and Duke of Burgundy Fritillary butterfly, have very specific micro-habitat requirements. – see Fig 1.

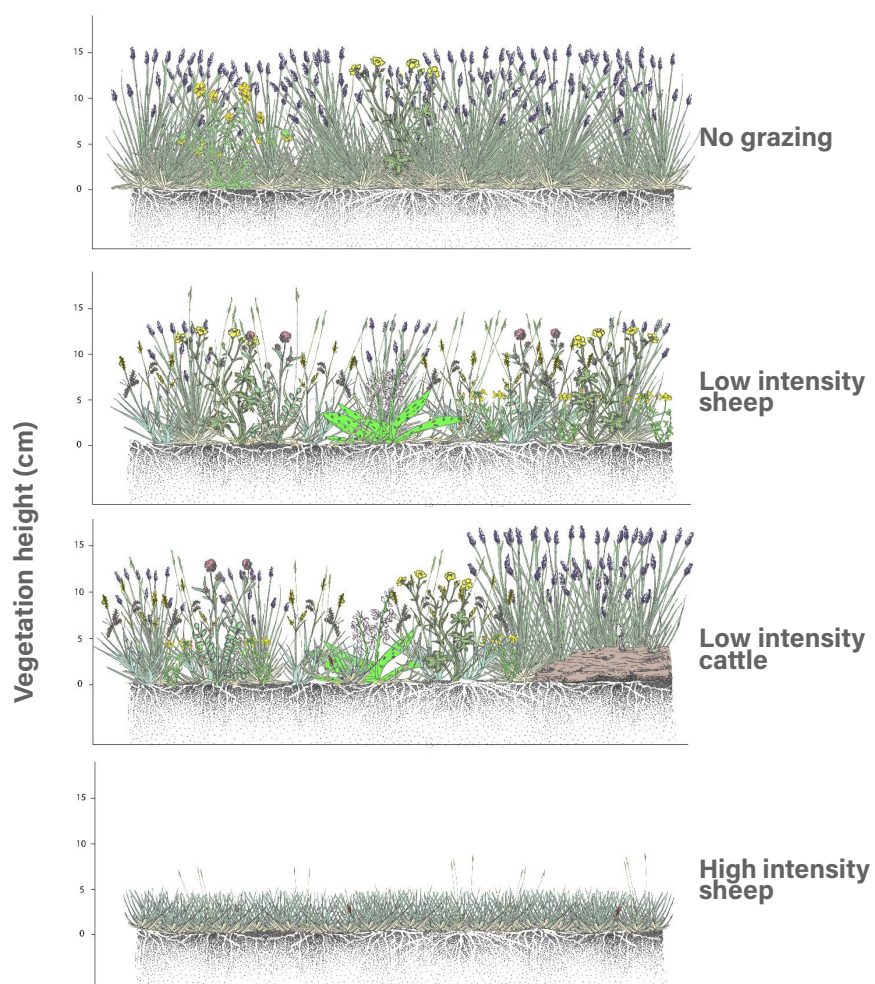


Figure 1: Diagram to illustrate the structural complexity benefits of low intensity cattle on calcareous grasslands. Lyons et al, 2018. Illustration by Thom Dallimore

Key Points for Grazing

1 Stocking rates for existing high quality calcareous grasslands may need to be quite low (around 1.5 - 2 LU/ha) as these are low fertility grasslands; it is the nutrient-stressed environment that enable the herbs, fine-leaved grasses and sedges to predominate.

2 Overstocking may lead to the creation of large areas of bare ground and the deposit of excessive nutrients from urine and nitrogen can provide conditions where undesirable pasture weeds, especially thistles, may germinate and thrive. White clover may also proliferate – a species which when abundant is considered a negative indicator for high nature value calcareous grasslands.

3 It is a common mistake to follow the same management every year by avoiding grazing in every Spring and Summer. This will favour growth of more aggressive grass species and the establishment of scrub – spring is when scrub seedlings will become established and once established, it is hard to stop them growing! For larger sites, cattle can be used to lightly graze then move on to the next block during this time. Cattle are less selective browsers than sheep, so will create a structurally diverse sward and their hoof prints will provide important microhabitats and germination sites for orchids and some of the annual and fine-leaved plants such as Eyebrights and Fairy Flax.

4 It is usually beneficial to avoid grazing in May and through to early July which is the most productive time for flowering and insects. Caveat – see point below.

5 Avoid overstocking to prevent excessive bare ground exposure and loss of chalk flora diversity.

6 Effective Bracken Management where required. Twice a year (May/June and Jul/Aug).

7 A higher stocking rate may be needed on deeper, loamy soils and when land is being restored or grassland is being re-created from arable. Taking hay and/or topping is usually advised during the early years of arable reversion to grassland. Haymaking is a traditional activity on calcareous upland meadows.

8 Timing and stock numbers at any time need to be designed to meet the objectives for the grassland management or restoration. These can also differ greatly from place to place – soils, geography, climate and aspect are important variables and will also depend on the species and, if cattle, the age and size of animals available. Understanding context and locality is vital.

9 Heavy stocking with sheep needs to be avoided during spring and summer – sheep will selectively graze the herbs and remove all the flowers, and promote undesirable species such as white clover. Cattle are usually preferred to sheep for grazing in late spring and summer, but sheep are excellent for following on in late summer through to early spring and to create the short downland turf that many species of this habitat depend upon. These include species such as Horseshoe Vetch, upon which the Adonis Blue and Chalkhill Blue butterflies lay their eggs in Spring.

10 If required control scrub and encroaching hedgerow species such as blackthorn with cutting (Nov Feb) - Avoid disturbing breeding birds.

11 Suggested Grazing Schedule (lowlands):

- Jan-Feb: Light grazing to remove old vegetative growth.
- March: Light grazing to produce short downland turf where this is an objective and to take off any early grass growth.
- April–Mid-July: Zero or low intensity grazing – with May and June being key months to avoid grazing. However, spring grazing should not be avoided every year as this will risk establishment of scrub seedlings.
- Mid-July–Dec: Main grazing period

2. Nutrient Management

The standard, prescriptive approaches, recommended to reduce nutrients in the soil, during the restoration of calcareous grasslands will vary according to the condition and context of the land being restored i.e., (1) abandoned and under grazed (2) agriculturally improved permanent grassland or (3) arable reversion.

- Keeping nutrient levels low is essential to maintain a high diversity of flowering plants and to reduce grasses, especially the more vigorous species.
- Remove all artificial inputs: fertilisers, run off from other areas of farm/other farms, supplementary feeding areas in fields and manure or slurry applications.
- Introduce Hemi parasitic plants e.g. eyebrights which attach to the roots of grasses and remove nutrients, reducing vigour. Note they need bare soil to germinate and light so tall swards will need to be grazed away first to enable their establishment.
- Grazing: ruminant livestock will reduce nutrients from the soil over time, through their meat, wool and milk. It is slow but steady as a method. In addition, cattle in particular like eating taller swards and so will remove any dominant grasses, allowing better establishment of wildflowers.
- Mowing – if you cannot graze an area then consistent cutting and removal can be used but if working on nutrient rich soils it may promote more growth to begin with. If not done at the right time it can also prevent the seed heads from scattering.

3. Seed Expression and Re-Introduction

Undermanaged and Abandoned Grasslands

Soil under grassland where grazing has been abandoned, but where agricultural improvement has not taken place, will usually contain a seedbank of the former chalk grassland flora. With the correct management it may be possible to restore such areas with a mixture of scrub clearance, grazing and (depending upon the slope) cutting. Topsoil scraping is an option rarely used under specific circumstances.

Improved Permanent Grasslands

For successful restoration on improved permanent grasslands seed introduction in late Summer (August) will usually be required alongside the following condition:

- relatively low phosphate and nitrogen level
- no or few pasture weeds
- no scrub or bracken stands
- low abundance of white clover in pasture
- some seeds will only germinate after vernalisation (exposure to the extended cold periods i.e. Winter)



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Ground Preparation

Take a hay or haylage cut in July OR graze tightly cutting as close to the ground as possible - scalping the ground if possible.

Create exposed bare ground providing bare soil where the sown seed can germinate. Aim to expose 30-50% by power harrowing (to no more than 2.5cm/1" deep) alternate strips of the grassland. Creating sufficient areas of bare ground before sowing seed is extremely important - insufficient intervention will lead to project failure. For sward enhancement only, the area of the sward disturbed can be as little as 30% in strips; this saves on costs, including seed. Once established the wildflowers do not have far to spread into the rest of the grassland.

Sourcing and Sowing the Seed

Ideally the restoration site will be adjacent to an **existing high quality landscape** and if possible seed or 'green' hay from that landscape should be collected and used. Note: only seeds that were ripe at the time of cutting will be collected.

Seed can also be purchased from **specialist growers and companies** that harvest high nature value (HNV) grasslands. Advice should be sought when purchasing seed.

The **sowing rate** into existing grassland can be as little as 3kg/ha of wildflower seed only.

If a mix containing grasses is sown then 10-15 kg/ha should suffice. The area calculation will be that of the whole field parcel x 30% or 50%, i.e. the area of the disturbed ground/strips only.

Sow seed in **August** and only on the soil/ground that has been pre prepared.

Do not direct drill the seed. They must be left on the surface but can be lightly rolled.

Plant species that parasitise grass should be included in the seed sown. For wild-harvested seed both Eyebright and Yellow Rattle will probably be in the mix. For crop grown seed, the mix needs to include Yellow Rattle. Eyebright is not grown commercially.

Green Haying: The spreading of fresh cuttings from successful calcareous grasslands to new habitats is particularly helpful where you are able to take the cuts from a nearby successful calcareous grassland. It will of course only work for those seeds that were present at the time of cutting. This was the main technique used to create/restore a large area of meadowland on the Thames floodplain at Chimney Meadows in Oxfordshire.

Bale Grazing: Where ruminants are supported over winter with hay from an existing HNV (High Nature Value) calcareous grassland it may be possible to introduce seed through the process of by rolling out these bales, with cattle trampling to put the seeds into contact with the ground. The success of this method may require significant patience and relies upon there being a decent quantity of seed in the bales (there might not be). The vegetation hay can act as a mulch as well and so- caution is advisable as this could create localised nutrient enrichment if swathes of damp hay are left on the ground. The increase nutrient levels may encourage dominant grass species over the wild flower diversity.

Arable Reversion

In arable reversion sites it may be necessary to plant phosphorus-absorbing species to mitigate legacy enrichment ahead of species rich grassland introduction and re-seeding. e.g. Cover crops like rye, oats, wheat, barley and buckwheat can be used.

The ground must be clean. Bastard fallow for spring summer is usually advised. Grass weeds (brome, etc) are alleopathic and can interfere with germination of expensive seeds that will be introduced.

Destroy the last summer weed chit, create seedbed, broadcast the seed. Spread by fertiliser spreader, manual or seed drill which trails the seed on surface. Ring roll.

Natural regeneration of species rich grasslands can occur if there's a downland above the reversion field but it will be slow. If this approach is used then the reversion site should be sown with fine-leaved grass species only at a low rate- crested dog's tail, smaller catstail, common bent, slender red fescue or sheeps fescue if its available.

Note: Introducing diverse seed mixes often accelerates restoration. However, it may not replicate the target communities fully.

4. Early Management of Restored Grasslands

Lightly graze the fields in the **autumn** until the end of the growing season (end of October) taking care not to overgraze and cause pasture damage. Leave the sward as short as possible. Yellow rattle will not grow if the grass is left long or is long by the time it germinates in April. (Note that timings will vary according to geographical location and altitude).

From the **first spring** (April), the grassland needs to be topped regularly or lightly grazed through the Spring and early Summer to maintain full sunlight to the developing seedlings. This is the most critical time for seed germination and seedling survival. Regularly check the sown areas and intervene with topping as soon as grass growth risks overtopping the seedlings. Swathes of dense cuttings need to be quickly removed. Wild flowers have ground-hugging leaves and it is these that require light to succeed. Encourage Yellow Rattle by topping above Yellow Rattle (YR) plants. This annual species needs to be able to set seed and get established in subsequent years. (In the lowlands its seed is usually ripe from early June.)

From the **second year** a hay cut should be taken to ensure that cut pasture is tedded and rowed, allowing ripe seed to be dropped back on to the ground and assist the process of wildflower establishment and spread. If taking hay is not possible then light cattle grazing may be a suitable alternative, but timing will need to be reviewed subject to field observations of progress.

Once the flower-rich sward is established it is advantageous **NOT to use the same cutting date every year** for hay as this will favour grazing-intolerant species, such as Hogweed and False-oat Grass. Hogweed is a species to control before it invades and becomes abundant.

Leave uncut margins around the field, vital for invertebrates. Rotate the uncut margins from year-to-year to prevent blackthorn and bramble from suckering out into the field or other shrubs from growing.



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5. Weed Management

Perennial weeds can be controlled by: **mowing** (nettle), **pulling** (ragwort, and creeping thistle - pull just before flowering) and **cutting** (spear thistle). Dock can be reduced by knifing the rootstock just below the soil surface and as it comes into flower (a sharp spade also works). Ragwort, if present, should be rogued prior to the hay cut.

Herbicides should ideally not be used, other than for **spot-treatment** (manual/knapsack) of perennial weeds. Herbicides for dock and thistle are not as specific as they might claim to be, and some will kill sown wild flowers. Timing of weed control is critical. There is no point leaving this to after the plants have gone into flower as they will set seed and then this will be shed. Spot spraying is best targeted at young soft leaf rosettes

Weed wiping: graze the field first, leaving foliage of thistles or docks proud - weed wipe in May - early June (docks before flower buds open, usually May). September regrowth after a summer hay cut is a good time, or in April.

6. Monitoring and Research

- In any Calcareous grasslands it is important to commit to multi-decade annual monitoring to track vegetation trajectories and adapt management accordingly. This can be done through soil analysis, pasture diversity surveys, ground pollinator counts, bird and butterfly surveys and photographic records.
- Engage local communities in monitoring through citizen science platforms like iNaturalist to reduce costs and foster stakeholder engagement.
- Take surveys from South facing slopes in areas with the greatest structural diversity and flowering plants.
- Register for free with UK Habitat Classification (<https://ukhab.org/>) to access Version 2.0 of UKHab. It provides detailed guidance on the sub habitat types and the species that would likely be seen in each and provides a good description to determine what you may currently have and what you may be able to achieve in restoration.
- The Field Studies Council has great plant identification guides in their FoldID series and there are many great apps for plant and bird identification.
- Note: Butterflies are more likely to be spotted in low wind conditions and in abundance only on true calcareous grasslands

7. Climate Considerations

Climate change poses significant risks to calcareous grasslands. Understanding these risks helps in planning adaptive strategies:

- Wetter, warmer winters favour coarser grasses and earlier grass growth.
- Drought will impact upon forage availability and grasslands may not require grazing during a prolonged drought period.

8. Relevant Environmental Land Management (ELM) Options

This resource has been created in March 2025. It is currently expected that Countryside Stewardship will reopen in the Summer (2025) and Sustainable Farming Incentives will reopen in 2026. The actions listed below are not an exhaustive list and may change, dependent on the actions list made available when these schemes reopen.

- GS6: Management of species-rich grassland.
- GS7: Restoration towards species-rich grassland.
- GS8: Creation of species-rich grassland.
- GRH8: Haymaking Supplement (late cut).
- GRH6: Manage priority habitat species-rich grassland (endorsed).
- SP6: Cattle grazing supplement to enhance environmental outcomes.

Conclusion

Calcareous grasslands require integrated management approaches combining traditional grazing practices with innovative restoration strategies. Addressing challenges including nutrient enrichment and seed limitations will ensure their long-term sustainability. Collaboration, monitoring, and adaptive management will drive success in restoring these unique ecosystems.

With Thanks

This document has been reviewed and additional material provided by Sue Everett MCIEEM (Ret), PGDip Arch: AEES - Ecologist and Land Management Adviser E: valuingbiodiversity@gmail.com



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Useful Organisations

Determine if your farm lies within a National Park, AONB or other area where visiting initiatives aimed at recovering biodiversity, improving water quality and soil health may already exist. There may be funding support if your project links to any existing local initiatives. Useful contacts are usually the local wildlife trust, FWAG, AONB, National Park, etc.

Use the UK Soil Observatory to learn more about your soil type and texture and underlying geology.

<https://mapapps2.bgs.ac.uk/ukso/home.html>

Use DEFRA's [MAGIC](#) map for England to determine relevant protected areas and similar habitats nearby (England Only)

There are major benefits from networking with other groups, the [Nature Friendly Farming Network](#) and [Pasture for Life](#) both have online forums and membership options for asking questions and sharing knowledge and resources. The [Nibblers Forum](#) focuses on conservation grazing throughout the UK, with members from wildlife NGOs as well as private landowners and farmers.

An organisation dedicated to protect and restore plants and fungi with an excellent online identification resource <https://www.plantlife.org.uk>

Many wildlife trusts now have seed harvesters and specific initiatives to restore flower-rich grassland.

Nature recovery maps will be a vital guide to direct restoration efforts.

e.g. <https://www.dorsetcouncil.gov.uk/w/mapping-for-nature-recovery-dorset>

Recommended Apps for Monitoring

Plants: Google Lens, iplant, iNaturalist

Birds: Merlin App

YouTube Webinars

[Conservation Grazing in Chalk Grasslands](#)

[PfL Webinar - Restoring and creating small areas of native wildflower meadow](#)

[Creating a Meadow in the Conwy Valley \(Spring into Action with Plantlife talk\)](#)

[PfL Webinar - Meadow Restoration Techniques](#)

Online Articles

A partnership of 150 organisations with a common vision to create nature-rich chalk and limestone landscapes that benefit all <https://www.big-chalk.org/>

Online Educational resource GLNP (greater Lincolnshire Nature Partnership) Management Lowland Calcareous Grasslands: A Guide to Management: <https://glnp.org.uk/images/uploads/services/localsites/LWS%20Management%20Leaflets/Lowland%20calcareous%20grassland.pdf>

How To Rewild: <https://howtorewild.co.uk/guide/calcareous-grassland>

Lowland Calcareous Grasslands: Creation and management in land regeneration: https://cdn.forestresearch.gov.uk/2022/02/bpg_18.pdf

Lowland calcareous grassland: <https://www.wildlifetrusts.org/habitats/grassland/lowland-calcareous-grassland>

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DEFRA Northern Ireland Habitat Guide - Calcareous grassland: <https://www.daera-ni.gov.uk/publications/habitat-guide-calcareous-grassland>

Buglife Management Lowland calcareous grass: <https://www.buglife.org.uk/resources/habitat-management/lowland-calcareous-grassland/>

Lowland Calcareous Grassland | Habitat Mapping Project | Nature Recovery Network: <https://www.youtube.com/watch?v=Y8sOT1Rg6P4>

Habitat Talk: Neutral and Calcareous Grasslands: <https://www.youtube.com/watch?v=PPpPNdpmBJU>

Upland Calcareous Grasslands: <https://afterminerals.com/advisory-sheet/upland-calcareous-grassland/>

UKHAB: <https://ukhab.org/>

Land management toolkit. Calcareous Grassland: <https://www.welshwildlife.org/sites/default/files/2022-03/No.4-Habitat-Management-Toolkit-Calcareous-Grassland-FINAL.pdf>

Online Educational resource: Kent Wildlife Trust Land Management Advice Series: https://www.kentwildlifetrust.org.uk/sites/default/files/2024-01/KWT%20Land%20Mgt%20Advice_Sheet%203%20-%20Mgt%20of%20chalk%20grassland.pdf

Floodplain Meadows Technical Handbook (Floodplain Meadows Partnership): <https://www.floodplainmeadows.org.uk/floodplain-meadow-technical-handbook>

Limestone grasslands in the Yorkshire Dales: <https://warmerandwilder.blogspot.com/2016/04/nature-friendly-farmers-abandoned-by.html>

Coronation Meadows: <http://coronationmeadows.org.uk>

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