TECHNICAL NOTE TN686 (Revised) / September 2024

Developing grazing plans for the conservation of semi-natural habitats

Farm Advisory Service

National Advice Hub
T: 0300 323 0161
E: advice@fas.scot
W: www.fas.scot

Summary

- **Grazing is one of the most important tools for managing semi-natural habitats**
- **A grazing plan provides a framework to deliver different aims and objectives in habitats of conservation interest**
- **Baseline surveys and ongoing monitoring can help determine if the aims of the grazing plan are being met.**
- **Choice of livestock, stocking rate and grazing systems are all factors that must be incorporated into a grazing plan.**
- **Although guideline stocking rates can be provided for different habitats these can vary significantly between site and between years, so grazing plans should be adaptive and make adjustments when required.**
- **Maintaining high standards of animal welfare are important, but it is also important to consider the impacts of practices such as supplementary feeding and worming medicines, which can be detrimental to biodiversity. entary feeding and worming medicines, which can be detrimental to biodiversity.**

Introduction

Grazing is an important process in natural and semi-natural habitats, influencing the plant species composition and structure of woodlands, heathlands, wetlands and grasslands and creating areas of disturbance that provide habitats for plant and animal species that might not otherwise occur. However, both overgrazing and undergrazing can result in changes to habitats that may be undesirable for conservation objectives. Grazing management plans are therefore a key element of managing many habitats for conservation.

Historically, a range of wild herbivores (including some, such as wild cattle, that are now extinct) would have provided the grazing function and their numbers and distribution would have been affected by predators, many of which are also no longer present. Domestic livestock have taken the place of wild animals in many cases and have always been the most important herbivores in many man-made habitats of conservation interest such as semi-natural grasslands.

Aims and Objectives of Grazing

The content of a grazing plan will depend on the objectives of management so these should be clear from the outset. These objectives can include one or more of the following:

- Maintaining a habitat that is currently in good condition
- Preventing ecological succession to another habitat considered to be of lower conservation value (e.g. encroachment of scrub or coarse grasses onto species-rich grassland)

SAC CONSULTING
Part of Scotland's Rural College (SRUC)

Scottish Government
Riaghaltas na h-Alba
gov.scot

011024FJ

- Restoring a habitat that has started to convert to another less desirable habitat
- Encouraging conversion of one habitat to another (e.g. encouraging woodland or scrub regeneration)
- Creating suitable conditions for a particular species of plant or animal
- Protecting ground-nesting birds or flowering plants
- Avoiding compaction and erosion of soils

Some of these objectives have opposing aims (e.g. preventing scrub encroachment vs. encouraging woodland and scrub regeneration) and this reflects the fact that grazing plans are site specific and may have different priorities depending on where the greatest biodiversity benefits are.

Aims and Objectives of Grazing

Determining when a habitat is in good condition requires some type of baseline survey and monitoring to assess indicators of habitat condition. These may include:

- Habitat mapping (using a standard methodology such as Phase 1, NVC or WFP Biodiversity Audit) to measure changes in the extent of habitats across a site
- Fixed point photography to record visible changes over time
- Presence, frequency or abundance of positive indicator (desirable) plant species
- Presence, frequency or abundance of negative indicator species (e.g. plants indicative of nutrient enrichment or disturbance such as nettles, docks and thistles)
- Sward height
- Amount of thatch or litter (build-up of dead plant material)
- Percentage of browsed shoots on trees or shrubs
- Presence of bare soil and/or erosion

There are a range of survey and monitoring methodologies that can be used to assess the condition of habitats, many of which consider current and historical grazing pressure:

- Common Standards Monitoring to determine if the features of protected areas are in favourable or unfavourable condition
- Wild Deer Best Practice Guidance for Scotland to measure herbivore impacts on upland and woodland habitats
- A guide to Upland Habitats – Surveying Land Management Impacts
- Peatland Condition Assessment
- Biodiversity Metric (for statutory planning gain in England, but a similar tool is likely to be developed for Scotland in future)

However, some of these methods take account of a range of factors and not just grazing, while some require specialist plant identification skills. To make habitat assessment more accessible, NatureScot is developing the Farm Biodiversity Scotland Audit app, designed to be used by land managers without specialist knowledge.

Choice of Livestock

The choice of animals to implement a grazing plan will often be determined simply by the type of livestock that the land manager has available. However, in an ideal world, the characteristics of different grazing livestock will be used to maximise the effectiveness of management.

Cattle prefer to graze taller vegetation (>10cm) unselectively and are best suited to more fertile sites with large quantities of tall and coarse vegetation such as rush-dominated wetlands and neutral grasslands (particularly if summer grazing exclusions have led to a growth of tall vegetation that sheep will struggle to graze down). However, their large size means that they are more likely to damage fragile sites with thin or peaty soils, although it also means they have more potential to create seed germination niches for woodland regeneration and to trample and weaken bracken rhizomes.

The large size of cattle means that there is a greater risk of them becoming stuck in wet and boggy areas and coupled with their relatively high value compared to sheep, this means it has become less common to graze cattle on extensive upland areas. However, the advent of no-fence collars has started to make it more practical by controlling the areas that cattle can access. In general, smaller, hardy native cattle breeds such as Luing, Galloway and Highlanders are preferred for grazing of many semi-natural habitats, rather than larger continental breeds or dairy-cross animals.

Sheep prefer to graze shorter vegetation (<10cm) selectively and are therefore better suited to vegetation types with a short sward, such as acid and calcareous grassland. Due to their lighter weight, they are better suited than cattle to sites with fragile soils. Both sheep and cattle will also browse woody vegetation including heather, trees and shrubs, particularly in the winter when more palatable plants are in short supply.

Horses and ponies have increasingly been used for conservation grazing on nature reserves as hardy breeds can be effective at controlling rushes and scrub encroachment. The Konik pony from Poland has been popular for this purpose due to its preference for wetland habitats, but it has been suggested that native breeds such as Highland and Eriskay ponies may also be effective and should be favoured for cultural and aesthetic reasons.

Deer and Goats have a greater preference for browsing than cattle and sheep and therefore their impacts on woodland, heather moorland and scrub can be higher than an equivalent stocking rate of livestock.

Livestock Units

The standard way of describing and comparing the grazing impact of different herbivores is to use the Livestock Unit (LU), where one cow and calf is one Livestock Unit and all other animals are given a value relative to that based on their grazing intake. Grazing pressure on an area of land can therefore be described using Livestock Units per hectare (LU/ha).

Table 1: Standard Livestock Unit measures for a range of domestic and wild herbivores in Scotland

Livestock type	Livestock units (LU)
Cow and calf	1.0
Other cattle >24 months	1.0
Other cattle 20 - 24 months	0.6
Ewes, hoggs and gimmers	0.15
Breeding goat	0.15
Red deer stag	0.25 - 0.40
Red deer hind	0.20 - 0.30
Roe deer	0.07
Llama	0.3

Stocking Rate, Stocking Density and Timing of Grazing

It is often difficult or undesirable to graze habitats with livestock all year round and so seasonal or intermittent grazing is required. To determine appropriate grazing levels in these cases it is important to understand the difference between stocking rate and stocking density.

- **Stocking rate** is the number of animals that an area of habitat can support over the course of the year.
- **Stocking density** is the number of animals on an area of land at any one time.

The difference between these two measures can be explained by considering a 6 hectare area of grassland that can support an overall **stocking rate** of 0.5LU/ha. This could be achieved by a wide range of **stocking densities** over different time periods e.g. 3 cows (0.5LU/ha) for the whole year, 6 cows (1LU/ha) for 6 months or 36 cows (6LU/ha) for a month.

Stocking rate is predominantly controlled by the annual production of vegetation within the habitat and, for maintenance of habitat, the rate at which this can be utilised (eaten) by herbivores without moving the vegetation away from good condition through over-grazing or under-grazing.

Maximum stocking density is also influenced by the available forage for herbivores, but other factors, such as the risk of damage to the sward and fragile soils through trampling, also become more important.

Practical conservation reasons for implementing seasonal or intermittent, rather than year-round grazing include:

- Providing a break to allow plants to flower and set seed
- Providing a break to avoid egg trampling of ground-nesting birds
- To reduce grazing in winter when browsing impacts on regenerating trees and shrubs are likely to be greatest (unless the aim is to reduce scrub encroachment, when grazing may be preferred at this time).
- To prevent damage to swards and soils in wet conditions

Animal husbandry reasons for grazing breaks include appropriate stock being unavailable at certain times of the year due to the farm management cycle, the inability of some vegetation to support the nutritional needs of livestock at certain times of year (particularly winter), the need to break the life cycle of parasites, and sites being too small to support a low stocking rate year-round (e.g. if the stocking rate equates to a very small number of animals or even less than one animal), making a shorter period of higher stocking density the only practical option.

Grazing Systems

Traditionally, conservation grazing has been based on set stocking principles, where a predetermined stocking density is applied to the whole site for a period of weeks or months. This can result in variable grazing levels across the site, which may be beneficial in some cases, but may also lead to localised under grazing or over grazing in some situations.

Recently there has been increasing interest in the potential for the use of rotational and mob grazing systems for biodiversity. Paddock grazing systems were originally developed to increase the productivity of livestock systems, often increasing grass utilisation from a typical level of c.50% in set stocking systems to 65-80%. This is achieved by rotating high densities of livestock (e.g. 15-30 LU/ha) around paddocks of up to 2-3ha in size, typically grazing each paddock for 2-3 days with a rest period of at least 2-3 weeks (longer in winter) before returning to the same paddock. This system is governed by sward heights and the grazing and rest periods are adjusted to match grass growth. This form of rotational grazing aimed primarily at increasing livestock productivity is unlikely to be ideal for conservation grazing as it will tend to reduce sward diversity and the grazing breaks are unlikely to be long enough to deliver the required benefits to flowering plants or ground-nesting birds.

By contrast, Mob grazing, sometimes referred to as holistic planned grazing or long grass grazing is a form of rotational grazing that may have potential to deliver biodiversity benefits in some habitats. This system uses similar stocking densities as normal rotational grazing but usually with smaller paddocks (e.g. 0.5-1.0ha and often enclosed by temporary electric fencing), shorter grazing periods (up to 1-2 days) and crucially, much longer rest periods of up to 40-80 days. The long rest periods mean that in more fertile grasslands, the vegetation can be very tall when livestock return to graze. In these types of habitats, mob grazing is therefore most suitable for cattle. The grass utilisation is similar to set stocking as not all of the taller vegetation is grazed and some is trampled and ultimately returned to the soil.

The potential benefits of the mob grazing are:

- The long rest period can be timed to benefit flowering plants or nesting birds in areas important for these species
- It allows plants to divert energy into developing stronger root systems, rather than into regrowing grazed foliage
- It builds organic matter in the soil, making habitats more resilient.

Mob grazing is a system that requires regular management input, moving electric fences and providing water in small paddocks. It is also a very flexible and adaptive system, with the ability to adjust rotations, enclosure sizes, stocking densities and rest periods to suit the biodiversity requirements of the habitats and to respond to changes in vegetation growth rates within and between years. Some proponents of mob grazing will also use hybrid systems or switch between set stocking and mob grazing depending on circumstances. However, this can make it complicated to write a grazing plan that will meet the requirements of agri-environment schemes which often require a calendar of stocking densities throughout the year.

Further information about mob grazing is available from the Soil Association:
https://www.soilassociation.org/our-work-in-scotland/scotland-farming-programmes/mob-grazing/

Grazing Systems

Grassland

Semi-natural grasslands are the habitats that are most dependent on grazing to maintain them in good condition. Semi-improved or neutral lowland unimproved grassland can support utilisation of up to 70% of the annual vegetation growth by herbivores without adverse effects. For less productive upland acid grasslands, the sustainable utilisation rate is more likely to be 30-40% of annual vegetation growth, meaning that stocking rates will generally be much lower on those types of grassland. Guideline stocking rates for different grassland types are provided in Table 2, based on data used for the Woodland Grazing Toolbox. These are likely in most cases to maintain a varied sward structure, but bear in mind that some species of conservation interest may have more specialised requirements. For example, Scottish primrose and waxcap fungi prefer very short swards, while some invertebrates favour taller grassland and if these are priorities at a particular site, the stocking rate may need to be nearer one end of the range.

The productivity of grassland can vary significantly between sites due to variation in soil fertility and between years at the same site, depending on weather conditions. The guideline stocking rates should therefore be used as a starting point and an adaptive approach should be used, adjusting stocking rates as required if signs of under-grazing or over-grazing become apparent. Where a site is already in good condition, the existing stocking rate and grazing pattern should be determined and continued if practical.

Table 2 – Guideline stocking rates for semi-natural grassland habitats

Quality of grassland	Typical dominant species	Examples of NVC	Guideline annual stocking rate (LU/ha)
Good	Red Fescue, Crested Dogstail	MG3, MG5, MG6	0.7 - 1.4
Moderate	Sheep's Fescue, Common Bent	U4, CG10	0.4 - 0.7
Poor	Molinia, Nardus	U5, M25	0.2 - 0.4

Grassland will generally support higher stocking densities in the summer than winter, so a grazing break, or lower intensity grazing, during the winter is ideal to avoid the need for supplementary feeding. However, if scrub encroachment is a concern, winter grazing may help to control this.

If the site is rich in wild flowers, a grazing break in the summer (May-July) is ideal although the length and exact timing of the break should be determined by rate of grass growth and the flowering periods of the species present. In this scenario, a period of higher stocking density is likely to be required in late summer/early autumn to remove the growth from the summer break. The maximum stocking density that it is safe to apply during this period will vary depending on the fragility of the sward and soil. Typical mob stocking densities may be possible on well-drained good quality grassland with resilient soil, but on fragile upland acid and calcareous grasslands greater care will be required, and stocking densities up to 1.5-2 LU/ha may be more appropriate.

Where ground-nesting birds of conservation interest such as Lapwing, Redshank and Curlew are present, ideally a grazing exclusion period should be used to allow them to nest without the risk of nest trampling (or egg predation, which sheep sometimes do). If grazing exclusion is not possible, a stocking rate no more than 0.6LU/ha should be applied to the nesting period. For Lapwing, the main nesting period is from early April to early May, while for Curlew it is mid-April to early June.

Wetlands

Wetlands cover a broad range of habitats from nutrient poor fens which can support only very low levels of grazing to areas of species-poor rush pasture that may be able to support stocking rates similar to moderate or good semi-natural grassland. Guideline stocking rates for typical unimproved wetland habitats are provided in Table 3. Very wet swamps, where the water table is above the surface are not generally suitable for grazing.

Table 3 – Guideline stocking rates for wetland habitats

Habitat	Examples of NVC Communities	Guideline annual stocking rate (LU/ha)
Nutrient poor fen	M4 - M10	0.05 - 0.25
Unimproved rush pasture	M23	0.25 - 0.4

Animal welfare considerations are important in wetlands due to the risk of animals becoming stuck in soft ground. Grazing may not be possible in autumn and winter if the ground is too wet, and if the wetland supports a high diversity of flowering plants or ground -nesting birds a grazing exclusion may be beneficial in the spring or summer. As with grasslands, this means that late summer and early autumn is likely to be the period of highest stocking density if conditions allow. Due to the wet conditions it is best to spread the grazing over a long a period as possible (e.g. mid-July to mid-October) so that stocking densities are not too high. In rush dominated wetland, sheep are likely to struggle with the tall and coarse vegetation, so cattle (or ponies) are usually the preferred grazing livestock for this type of wetland.

Heath and Bog

Heath and bog habitats typically occur in extensive upland mosaics over large areas, which often also include areas of grassland habitats as well. Dry heath occurs on predominantly mineral soils where the vegetation is typically dominated by heather, blaeberry and related species. Wet heath is found on shallow peaty soils (<50cm deep) and also supports heather, along with cross-leaved heath, bog myrtle, Molinia and often some sphagnum moss. Blanket and raised bog occurs where deep peat soils (>50cm deep) are found and is dominated by heather, cotton grass and sphagnum moss.

Peat and peaty soils and the sphagnum mosses on their surface are soft and very vulnerable to trampling damage and erosion, while the vegetation is very slow to grow and recover. Consequently, recommended stocking rates on blanket bog are very low and arguably this habitat does not need grazing by livestock at all. Eroded bogs and those being restored should have extremely low stocking rates. Where blanket bogs have been artificially drained, grazing (at a similar rate to wet heath) may be more appropriate to help control the more vigorous heather and trees such as birch that regenerate onto the bog surface and exacerbate the drying process. However, ideally this should also be a precursor to efforts to rewet the bog and reduce the need for grazing in future.

Wet and dry heath at lower altitudes (<600m in the east and <400-500m in the north-west) are habitats that would once have supported woodland and scrub, so grazing can be an important tool to retain these open habitats where they are valued. Guideline stocking rates are provided in Table 4 and are lower for wet heath as the peaty soils are more fragile and vegetation growth is generally slower. Heathland at higher altitudes and very steep slopes should generally be excluded from any stocking rate calculations as they are unlikely to support many livestock or require grazing.

Table 4 – Guideline stocking rates for heaths and bogs

Habitat	Examples of NVC Communities	Guideline annual stocking rate (LU/ha)
Dry heath	H9, H10, H12, H16	0.10 - 0.15
Wet heath	M15, M16	0.05 - 0.10
Blanket Bog and Raised Bog	M17, M18, M19	<0.05*

* < 0.02 recommended where restoration has taken place

Heaths and bogs are generally best suited to longer periods of grazing and are not suitable for short bursts of heavy grazing, unless the heath has a high proportion of grasses. Summer grazing over a period of several months is ideal. If these habitats are grazed in winter, the stocking density should be kept below the annual stocking rate as heather is vulnerable to browsing by livestock in winter. Sheep are the most common grazing livestock on heaths and bogs although there is increasing interest in using cattle on some heaths, where they may be helpful to reduce dominance by Molinia. This has become a more viable option with the advent of virtual fencing systems (no-fence collars). Cattle grazing on bogs has a higher risk of damage to the peat and vegetation surface.

In many upland landscapes, the impacts of wild deer also need to be taken into account as they will also graze and browse heath and bog vegetation. As deer tend to roam over large areas, deer densities are usually expressed as deer per km2 rather than as livestock units. In open upland landscapes, a maximum deer density of 8-10 deer per km2 is recommended to prevent damage to moorland habitats. This equates to around 0.02- 0.03 LU/ha and reflects the fact that large upland landscapes contain significant areas of montane heath and blanket bog that are fragile and vulnerable to overgrazing and trampling, while deer can also concentrate in favoured areas where their impacts may be greater.

Scrub and Woodland

A low level of grazing can help maintain a more diverse ground vegetation structure in woodland habitats, creating niches for a range of woodland species. However, the shade of the tree canopy means that there is less forage available than in open habitats and as trees and shrubs are vulnerable to damage by browsing and rubbing, the appropriate stocking rates are very low (Table 5).

Table 5 – Guideline stocking rates for native woodlands

Habitat	Examples of NVC Communities	Guideline annual stocking rate (LU/ha)
Upland Pine, Birch or Oak	W4, W17, W18	< 0.02
Lowland Woodland	W8, W9, W10, W11	< 0.05

Due to the browsing risk, particularly where trees and shrubs are regenerating, winter grazing should either be avoided or kept at a low level. Short, one-off pulses of mob grazing at higher rates than those in the table can be used in woodland to help break up rank understorey vegetation such as heather and to create patches of bare ground suitable for tree seedling regeneration. For example, at Abernethy Forest at Strathspey, cattle were grazed in heather dominated pine woodland at stocking densities up to 2.5LU/ha for periods of up to 2 months in the autumn (equivalent to around 0.15LU/ha annualised stocking rate) and this doubled the cover of blaeberry in the ground vegetation.

Wild deer also need to be considered in woodland habitats and a deer density of less than 4 deer/km2 is generally considered appropriate for woodland. Where high levels of woodland regeneration are being sought (e.g. expansion of woodland onto open ground), even lower deer densities of 2 deer/km2 may be required.

Grazing Habitat Mosaics

On many sites, there may be a mosaic of different habitats present (e.g. woodland, wetland and grassland). If the aim of management is to maintain the balance of habitats in the mosaic then the initial stocking rate should be determined by the proportion of the site occupied by each habitat multiplied by the guideline stocking rate for that habitat. If management is aimed at one component of the mosaic, then an appropriate stocking rate for that component should be used. Monitoring is particularly important in habitat mosaics as grazing animals may not graze each component habitat at the appropriate rate, leading to localised over- or under-grazing. Where large upland mosaics including woodland are being managed, it is important to remember that herbivores (livestock or deer) may move into the shelter of the woodland in winter, resulting in locally high grazing and browsing pressure on one of the more sensitive parts of the mosaic, even if the overall stocking rate is low.

Livestock Welfare, Supplementary Feeding

It is essential that high standards of animal health and welfare are maintained under a grazing management plan. Physical dangers (deep ditches, quaking bogs), fencing, access for management and monitoring, food and drinking water are all factors that must be considered. The nutritional value of the vegetation is a particular concern as many semi-natural habitats are unable to provide sufficient energy to maintain the condition of certain types of livestock, particularly the more demanding types such as growing cattle and sheep.

Supplementary feeding can be used to offset the nutritional limitations of the vegetation, but this has disadvantages: it can reduce the amount of grazing of the vegetation; it can cause nutrient enrichment and sward and soil damage around feeding sites as well as localised over-grazing close to feeding sites and under-grazing further away. Ideally, conservation grazing management should try to avoid or reduce the need for supplementary feeding by choosing livestock whose nutritional requirements closely match the nutritional value of the

vegetation and by avoiding grazing during December-March when the nutritional value of most vegetation is at its lowest. Where this is not possible, the need for supplementary feed can be minimised by rotating groups of livestock through the site for short periods so that they do not lose condition. Otherwise, the minimum necessary supplementary feed should be used, which meets but does not exceed the requirement of the livestock. Mineral blocks with a low-moderate phosphorus content are likely to have the least negative impacts. Energy/protein concentrate blocks are the next best option, while bulky complete feeds such as hay and silage should be avoided as far as possible.

On large sites, the use of supplementary mineral and concentrate blocks can be beneficial to encourage livestock to range more evenly across the whole area. These can be moved around the site to avoid localised impacts of feeding, although on some sites sacrificial feeding areas may be preferable. In all cases, supplementary feeding sites should be located in dry areas more than 10 metres from any watercourse, in parts of the site with least conservation interest if possible and avoiding any sites of archaeological or historic interest. Choosing areas dominated by dense bracken, if present, may help reduce the vigour of this plant.

Author:

Paul Chapman, SAC Consulting

Impacts of Anthelmintic Wormers

The treatment of parasitic worms is standard practice in livestock farming, but there is increasing concern about the impacts of anthelmintic wormers on biodiversity. These medicines have been shown to reduce dung beetle populations, as well as other soil-dwelling invertebrates due to toxic effects. This has a knock-on effect on soil biodiversity, reducing the breakdown of livestock dung and its recycling into the soil as well as reducing the food supply of species of conservation concern such as the Red-billed Chough, which feeds on dung beetle larvae and other invertebrates associated with short grazed grasslands.

Livestock welfare must be maintained so removing anthelmintic treatment altogether is not currently advocated. However, implementing measures to reduce their use, such as faecal egg counts and targeted treatment can help reduce their impacts on the environment.

Production of this Technical Note was funded by the Scottish Government as part of its Farm Advisory Service.