Sward enhancement: choice of methods

Sward enhancement refers to management techniques which aim to increase the botanical diversity (mainly the wildflower component) of species-poor grassland. Such work can be funded under Environmental Stewardship, in particular Higher Level Stewardship. This note provides guidance on choosing the best method of sward enhancement for a particular site. Other notes provide guidance on how to select suitable sites and describe the main methods that can be used.

Key points

- Sites must be carefully selected to ensure the best chance of success.
- In some cases management changes can allow the sward to diversify naturally without adding seed.
- Usually seed will need to be added and gaps created in the sward to allow seedlings to establish.
- There are established techniques of enhancing swards by adding seed, but the best method will vary with each site.

Introduction

Not all grassland is suitable for enhancement. The main requirements include low soil fertility and low/no weed burden.

Enhancement methods usually involve disturbance to the sward, therefore some sites may not be suitable for example, where it could damage historical or bird interest, or increase the risk of soil erosion.

Where there are visible archaeological features, anything that will disturb these is inappropriate. In addition, below ground remains may be affected by some forms of ground preparation. You should consult your historic environment advisor to explore the options available and their suitability.

A meadow near Stonehouse, Pennine Dales

For more information see Technical Information Note TIN061 - *Sward enhancement: selection of suitable sites*.

Choice of methods

Is it always necessary to introduce wildflowers?

If a site has potential for enhancement the introduction of wildflowers is not always necessary or desirable.

On many sites wildflowers may already be present at low numbers in the sward. If they have not been allowed to flower they may occur only as vegetative rosettes which are easy to overlook. In addition the margins of the field or adjacent grassland and road verges may be species-rich and provide a natural seed source.

However, research has shown that seed of desirable species is often absent from the soil, and even where there are plants within the field or nearby they often do not spread. This may be because they are defoliated before they have set seed or, as commonly happens, there are insufficient gaps in the grass sward to allow establishment.

As a guide, the sward should have frequent gaps of at least 10 cm in diameter. There also needs to be a way for seed to disperse into these gaps. Many desirable species are not adapted to abundant seed production or wind dispersal. The most likely means of spread for many species is on the hooves or coats of livestock or by being eaten and seeds passing out in dung (although seed of many species may not survive gut passage).

Before looking at other options first consider whether changes to the management of the grassland would be sufficient to diversify the sward. For example where the desired species are well distributed, but at low frequency, or where you are confident they will spread from nearby.

The most influential management practices are:

- Reduce grazing pressure in the spring/summer to allow plants to flower and set seed.
- Introduce hay-cutting on pastures for a year or two as this can 'kick -start' diversification.
- Delay hay cutting until after flowers have set seed, for example until after mid July.
- On both meadows and pastures maintain or increase grazing in autumn so that hooves create gaps and press in seeds.
- Do not apply inorganic fertiliser or slurry.
- Do not apply broadleaved herbicides except by spot spraying or other methods that target specific non-desirable species.

One option is to change the management for a number of years and then assess the sward again and see if this is sufficient or if additional measures are required. Note, in many cases it will be necessary to introduce wild flowers because management changes on their own will not be insufficient to increase sward diversity to an appropriate level.

Where grassland is next to a Site of Special Scientific Interest (SSSI), seek advice from your Natural England adviser before seed or plants are introduced because non local seed may have harmful effects on species within the SSSI.

Where competitive species dominate it may be possible to control them by establishing yellow rattle *Rhinanthus minor* before introducing any other species.

Yellow rattle parasitizes a wide range of grass and wildflower species and consequently it has the potential to reduce the vigour of its hosts and hence overall grassland sward productivity. For further information see Technical Information Note TIN060 - *The use of yellow rattle to facilitate grassland diversification.*

How can wildflowers be introduced?

The main techniques are:

- over-sowing with wildflower/grass seed;
- slot seeding with wildflower/grass seed; and
- spreading species-rich green hay.

In a limited range of circumstances pot-grown wildflowers or seedling plugs can be used to add supplementary species. For further information see Technical Information Note TIN065: *Sward enhancement: diversifying grassland using pot-grown wildflowers or seedling plugs.*

There is no overall best method. Success will depend on many factors.

Sward enhancement: choice of methods

The most appropriate technique for a particular site will depend on a number of issues, in particular:

- the sources of seed;
- the livestock and machinery available; and
- what method best fits in with the management of the site and its existing environmental interests (archaeology, nesting birds etc).

Soil characteristics for example, soil type, depth, texture and wetness, may vary across a site. This may provide opportunity to try different treatments on different parts of the site.

The main requirements of each method are outlined in tables 1 - 4 below to help you decide which method is most appropriate for your particular site and circumstances. Details of each method are also given in separate information notes.

Whichever technique is used, appropriate management, both in the establishment phase and in the long term, is essential. In many cases this will require a change from the previous management, and there must be a commitment to continue the changed practices in order for the sward enhancement to succeed.

Further information

Technical Information Note TIN035: *Soil sampling for habitat recreation and restoration in agri-environment schemes*

Technical Information Note TIN036: *Soils and agri-environment schemes: interpretation of soil analysis*

Technical Information Note TIN038: *Seed sources for grassland restoration and re-creation in Environmental Stewardship*

Technical Information Note TIN050 *Selecting indicators of success for grassland enhancement*

Technical Information Note TIN060: *The use of yellow rattle to facilitate grassland diversification in agri-environment schemes*

Technical Information Note TIN061: *Sward enhancement: selection of suitable sites*

Technical Information Note TIN063: *Sward enhancement: diversifying grassland by spreading species-rich green hay*

Technical Information Note TIN064: *Sward enhancement: diversifying grassland by oversowing and slot seeding*

Technical Information Note TIN065: *Sward enhancement: diversifying grassland using pot-grown wildflowers or seedling plugs*

This note does not supersede prescriptions in agri-environment scheme agreements. If there is any conflict between the information in this note and your agreement please contact your Natural England Adviser.

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Table 1: Oversowing with wildflowers/grass seed

Requirements:	Most suitable if:	Also possible if:
Seed of appropriate species and origin[1].	Appropriate seed is available	
Bare ground/gaps must be created in August/ September before seed is sown.	Machinery (for example, disc or tined harrows) can be used to create 50% bare ground.	Cattle are available and the site is damp enough for their hooves to create frequent gaps of at least 10cm diameter .
Seed must be broadcast on the surface.	Suitable machinery is available, for example, fertiliser spreader, slug pellet applicator, grass seed box, modern arable seed drill capable of broadcasting seed.	Seed can be broadcast by hand.
Seed must be bedded in.	Cattle can be used to tread in the seed.	Sheep can be used to tread in the seed; or machinery is available, for example, a flat or ring roller.

Table 2: Slot seeding with wildflower/grass seed

Requirements:	An option if:
Seed of appropriate species and origin[1] (which must be clean, ie free of chaff).	Appropriate seed is available.
Specialist machinery ie a suitable slot seeder, fitted with a band sprayer	Machinery is available, for example, adapted Stanhay/ Gibbs sugar beet drill, Howard Rota seeder, Gallagher/Aitcheson Seedmatic.
Ground which is not water-logged, as slots may fill with water.	Ground is damp enough to allow slots to be cut, but not to fill with water.
Slug populations are low.	Slug populations are already low, or can be reduced by the application of slug pellets.

[1] See Technical Information Note TIN038: *Seed sources for grassland restoration and re-creation in Environmental Stewardship*.

Table 3: Spreading species-rich green hay

Requirements:	Most suitable if:	Also possible if:
Requires a source of species-rich green hay.	A suitable donor site is present on the same farm, or very close by.	
After cutting, hay must be immediately collected, transported to and spread on the receptor site.	Suitable machinery is available (for example, mower and baler) and the operation can be carefully organise.	
Bare ground/gaps must be created before hay is spread.	Machinery (for example, disc or tined harrows) can be used to create 50% bare ground.	Cattle are available and the site is damp enough for their hooves to create frequent gaps of at least 10cm diameter .
Hay must be bedded in after spreading.	Cattle can be used to trample the hay and tread in the seed.	Sheep can be used to trample the hay and tread in the seed, or machinery is available, for example, a flat or ring roller.

Table 4: Supplementary method - Plug planting

Requirements:	An option if:
Plug plants of appropriate species and origin.	Additional species are required in the sward which have not been introduced by the other enhancement methods, perhaps because they are very difficult to establish from seed.
	Particular species are required to meet other site objectives for example, a butterfly food plant.
	Certain species are being introduced to small areas of the site for example, damp areas, banks with different soil conditions.