Grassland creation on heavy and light soils

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Grass seed

Suffolk's grassland flora has a distinct genetic makeup. Indigenous plant communities and the species they support have adapted to the local soil, climate and management conditions over hundreds or thousands of years. In order to protect the genetic diversity of Suffolk's native grassland and maintain regional diversity, grassland creation or restoration projects should, wherever possible, use local provenance seeds i.e. seeds collected from native wildflowers in Suffolk.

Local provenance grass and wildflower seed mixes of East Anglian native origin are in short supply. The majority of grass seed supplies currently originate from North America or Australasia and many wildflowers have been cultivated and developed as agricultural fodder plants. Such plant material may superficially look like our own plants but, as well as diluting our own genetic wild plant diversity, subtle differences in their structure mean that some varieties cannot be used by insects. For example, certain bumble bees are unable to feed on cultivated strains of red clover, and the common blue butterfly larvae will not feed on foreign bird's foot trefoil.

Selecting the most appropriate method of grassland establishment can be confusing – and expensive. The following sections and tables summarise the key considerations and options for establishing grassland on ex-arable bare land and for increasing the botanical diversity of existing grassland.

Grassland establishment on bare land

- Establish the most important characteristics of the site – soil type, fertility and dampness and existing flora and fauna on and adjacent to the site. These characteristics will influence method of establishment and ground preparation.
- Wildflower establishment is best achieved on soils where nutrient levels (especially phosphate, potassium and nitrogen) are low and where competition from coarse grasses and dicotyledonous weeds is low. Ex-arable land will be high in nutrients.
- Delaying establishment to reduce nutrient levels on an ex-arable site will help establish a diverse sward. Stripping the top 20—25cm of soil will remove much of the soil nutrients and the seed bank containing competitive weed species. Planning permission is required to remove top soil from a site. Alternatively, consider taking an arable crop for another two years without using fertilizers to reduce nutrient levels.
- Whilst natural regeneration to create a flower-rich grassland is usually not an option on heavy land, it might be considered as the first option for light land sites and very small sites on impoverished soil surrounded by a good seed source, such as new pond edge or where a building has been removed. It is, however, the cheapest and most practical option for creating valuable rough cover.

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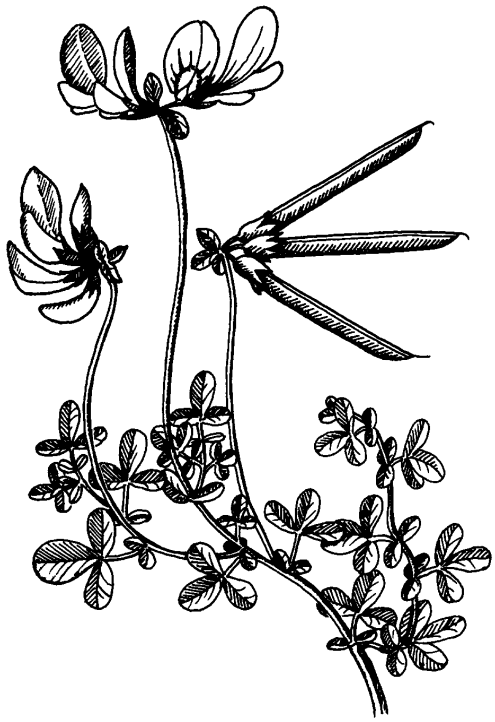
- For most heavy land sites, the best option for Suffolk's biodiversity (and probably the cheapest) would be to establish grassland using species-rich green hay from a local donor site. For small sites, scattering ripe seed collected by hand from local species-rich verges or meadows onto a prepared seedbed is a simple but often effective option.
- Use local seed wherever possible. This is best for wildlife and most likely to succeed. More expensive and difficult, but a good alternative, is to source a local provenance seed mix and establish grassland using a conventional method e.g. drilling or broadcasting into a well-prepared seed bed.
- The least desirable, and possibly harmful, option would be to use an expensive 'off the peg' seed mix containing non-British seeds.

See **Table 1** for a summary of methods, considerations and management pointers for establishing grassland on bare land.



Natural England

Common birds-foot trefoil

Increasing the botanical diversity of existing grassland

A species-poor grassland site usually results from the site having been agriculturally improved at some stage to increase its grassland yield or quality (e.g. for silage, top quality hay, haylage or intensive grazing). Thus, the site may have:

- been reseeded with agricultural strains of grasses, clovers and other legumes, and/or had fertiliser applied which results in a few species thriving at the expense of the smaller, more delicate plants, and/or had herbicides applied to reduce weed problems such as thistles and nettles which also results in the loss of other broadleaved plants.

Re-introducing wildflowers to an existing sward is not easy, particularly while soil fertility is still high. Consider the following recommendations:

- Stop all fertiliser and herbicide applications and continue to graze hard or take silage, haylage or hay cuts to reduce soil nutrients. This may take many years and until soil nutrients are reduced, any method of establishing wildflowers will have limited success.
- Once soil nutrients have been exhausted or reduced consider the options for introducing wildflowers outlined in **Table 2**, but be patient!

Other relevant SWT factsheets:

- Churchyard management
- Meadow creation
- Orchids
- Wildflower suppliers

Suffolk Wildlife Trust can advise further on local wildflower grassland sites and techniques for obtaining seed.
For further advice, contact Suffolk Wildlife Trust on:
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Table 1: Methods and considerations for establishing wildflowers on bare land

Method and key considerations	Key establishment management points	Comment on resulting grassland
Natural regeneration Often the most appropriate method for light soils. For very small, impoverished soil sites near species-rich areas.	Allow plants to regenerate but top regularly (2 to 4 times in spring and summer) in the first two years to increase grass tillering and sward establishment, and reduce annual and perennial weed problems.	Over several years of appropriate grazing or cutting, the established grassland will reflect the species found in nearby grassland. Early thistle and ragwort problems may need spot treatment.
Seed with locally harvested seed Harvest seed from a local flower-rich site (e.g. roadside verge, churchyard, unimproved hay meadow).	If sowing directly into ex-arable land, establish after harvest or undersow in a growing crop in the spring. Alternatively cultivate to create a good weed-free seedbed and drill or broadcast (hand or machine) seed in late summer or early autumn (well before frosts). Roll afterwards to firm up. Take a haycut the following year in June or July. Do not cut before unless there is an overwhelming weed problem (e.g. creeping thistle) in which case spot treat with glyphosate as soon as possible during the growing season.	Over a few years valuable grassland can be created reflecting the local characteristic grassland type and maintaining local genetic diversity. Some mobile insects and other wildlife which has adapted to the local donor grassland will colonise the grassland quickly. Less mobile species may take longer.
Seed with British native seed Check origins of mixes	As above	Valuable grassland can be created supporting a range of wildlife, but with less potential variety than above.
Introduce herb-rich green hay Select donor site with similar physical characteristics (soil type, pH, dampness etc). Harvest donor meadow at optimum time for maximum seed catch i.e. late June to early July (check meadow timing for best harvest). Check all the correct permission is given to harvest the site i.e. owners' permission or discuss taking green hay with English Nature if it is an SSSI.	Prepare seedbed on recipient site. Cultivate to create a weed-free firm site. Harvest donor site as big round bales and roll out all bales over recipient field within 24 hours (the sooner the better) to prevent heating up of bale. One ha of hay should be spread thinly over 2ha of the recipient site to avoid need for raking up and removal after 3 weeks. Loosen and scatter the rolled out bale using a rake, hay turner or muck spreader. The following spring and summer cut repeatedly to minimise thistle and other weed problems and to encourage the sward to tiller out. A light chain harrowing after hay is baled may encourage more seed germination. Then, if possible graze the aftermath until March or until the site shows signs of poaching, ideally with cattle to create some variety in sward structure. In the second and subsequent summers mimic the donor site's normal hay meadow management (June or July).	This method seems particularly suited to the crested dog's-tail-common knapweed grassland (National Vegetation Classification MG5), a widespread but uncommon flower-rich meadow on neutral heavy soils managed as hay meadow. Most species present in significant amounts from the donor site will establish in the new meadow, but some may take some years to do so. Indeed, it appears that hay strewing over other methods seems to promote colonisation by orchids *(I Trueman & P Millet in British Wildlife October 2003).* To maximise value for invertebrates, ensure as much variety in sward structure is created at the end of every year by leaving some areas uncut each year (up to one third) either as mid-field or field margin strips, rotated each year to avoid scrub encroachment at the margins.

Table 2: Methods and considerations for establishing wildflowers in existing grassland

Method and the key considerations	Key establishment management points	Resulting grassland
Introduce herb-rich green hay Select donor site with similar physical characteristics (soil type, pH, dampness etc). Harvest donor meadow at optimum time for maximum seed catch i.e. late June to early July (check meadow timing for best harvest).	Method 1: For a reseeded sward of low botanical diversity one method is to completely remove all vegetation on existing grass sward by herbicide (glyphosate) in late summer. Then follow method outlined in Table 1. Method 2: To avoid total vegetation removal of grass sward, retain but cut very short or graze very hard prior to hay strewing and create sites for germination by harrowing, raking or discing. After strewing hay as in Table 1, put livestock on field after a week or so to poach the site, eat hay and aid germination by digestion process.	As Table 1 for method 1. Method 2 is cheaper and less disruptive for soil-dwelling invertebrates but may not achieve as good result as method 1.
Rotovate and seed site with wildflower seeds Ideally use seed harvested from local species-rich site. Alternatively obtain British native origin wildflower seeds appropriate to soil and pH type.	Rotovate sward to open it up and broadcast seed (manually/ by machine) in early autumn. The grass matrix will be reformed as many of the original grasses regrow. Regular cutting (and removal of cuttings) may be required between April and October to prevent vigorous grass growth blanketing the slower establishment of wildflower plants. The following year manage by hay cutting, but delay grazing for two years or so to allow good root mats to establish.	
Slot seeding site with locally harvested seed Ideally use seed harvested from local species-rich site. Alternatively obtain British native origin wildflower seeds appropriate to soil and pH type.	Ensure existing grass is cut short or grazed hard prior to seeding in early autumn. Using a Hunters seeder, rotovate 10cm strips into existing sward. Using a Stanhay or Gibbs drills seed (2kg/ha bulked up by sand or barleymeal) and spray glyphosate herbicide along the seeding 'slot' or strip. Cut grass the following year whenever it exceeds 5cm to help reduce competition of establishing plants and to encourage good growth of root systems but avoid 'scalping' turf. The following year manage by hay cutting or grazing.	Over a few years valuable grassland can be created, especially if local provenance seed is used helping to maintain local genetic diversity. Mobile wildlife will colonise quickly.
Introduce wildflower plugs, pot grown plants or turves dug from a species-rich site Useful for small sites and where the early visual appearance of the site is important.	Ensure existing grass is cut short or grazed hard prior to planting. Do this in early autumn or, less ideally, in spring providing the soil is damp (but not frozen). To reduce competition from existing sward, spot treat areas with glyphosate to plant groups of plants or remove turf. Areas to treat and numbers to plant will depend on budget or turf size. The more plugs or larger turves planted, the greater the success! A recommended planting density is 2-9 plants per m^2. Due to their small rootstock, plants and turves may need additional watering, especially on lighter land. The following year manage by hay cutting or grazing.	Useful for introducing plants which do not establish easily from seed in mixes or those that produce little seed in cultivation but easily reproduce vegetatively.