

Restoring species-rich grassland using green hay

Green hay, taken from a species-rich donor site and spread on a species-poor recipient site, is another method of restoring and recreating wildflower grasslands. Green hay is harvested wildflowers and grasses just as they are shedding seed and still 'green'. The hay is quickly transferred to the species-poor recipient site where it is spread allowing the

seed to drop. Green hay can be relatively cheap; however the logistics of transferring the hay quickly need to be carefully planned. This means that the donor and recipient sites must be close together. Using green hay can be a very successful method of undertaking grassland restoration and recreation



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Site preparation

- All wildflowers have a range of environmental limits. If soil nutrients, or pH or water levels differ between the donor and recipient, this may affect the germination and spread of the plants. Undertaking soil nutrient tests is a good method to find out whether the land falls within the expected range of tolerance of most plants. If the environmental limits are exceeded, then seeds may not germinate, so it is important to research the current conditions. If the current conditions are not suitable for restoration, go to the information about stripping soil nutrients or consider wildflowers that can tolerate slightly more fertile conditions.
 - Identification of a suitable donor site is important. The donor and recipient sites should have a similar pH, soil texture and moisture. There may be limited germination if seed harvested from calcareous grassland is spread onto acidic soil, for example.
 - The donor and recipient grasslands need to be in close proximity to one another. Once green hay is cut and gathered together, it heats up very quickly which can make the seeds infertile. The operation of gathering the hay, transportation and spreading should be undertaken in the shortest time possible; recommended within an hour and definitely within half a day.
 - The future management of the recipient sites needs to be planned before undertaking the restoration. Appropriate fencing, access and water troughs may need to be installed prior to restoration or recreation if future plans involve livestock grazing. If the site lacks specific minerals essential for livestock these could be made available using mineral licks.
 - Control problem weeds such as docks, thistles and nettles, either by hand-pulling, or spot-spraying (seek advice on suitable products and do not use alongside waterways). It may take more than one year to control these plants and should be done with enough time for to be effective. Using herbicides after restoration will also kill wildflowers and grasses. The recipient site is not suitable if it has a high weed problem and an alternative site should be chosen.
- Create a short vegetation sward in the recipient field during the preceding autumn and spring, before restoration. The objective is to create bare ground - at least 50% - as all wildflower and grass seed need to touch bare soil. They also require a low level of competition with any vegetation already present to be able to germinate and survive.
 - If your recipient site is a grassland, create 50% bare ground in June to Mid-July by:
 - allowing livestock (ponies, cattle and sheep) to graze the recipient field, reducing vegetation growth. The recipient site should not be poached by livestock hooves. Poaching (or pugging) is where cattle, ponies and sheep leave pock-marks with their hooves in grassland, particularly after wet weather, on clay soils with poor drainage. This denudes large areas of any vegetation and can cause damage, particularly compaction. It can also increase weeds such as docks. Livestock should be removed from the field if there is very wet weather or if poaching in gateways or along fence lines starts to become apparent
 - livestock grazing can be by pulse grazing (increasing, and then decreasing, the number of livestock for a short period of time) or by extensive grazing (a lower number of livestock are allowed to graze for a longer period) to reduce the vegetation cover and create bare ground. This is not an exact science, and livestock should be removed if they start to cause damage or there is



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actively, animals could be added to increase the amount of grazing and creation of bare ground.

- do not supplementary feed livestock (giving them additional hay or silage on top of the vegetation growing in the field).
- additionally or alternatively, scarify the field using a disc and/or chain harrow. Tine harrows can also be used to remove grass thatch.
- a combination of livestock grazing and mechanical management is useful in the first instance to create bare ground.
- If your recipient site is an arable field, create bare ground in early July by:
 - cultivating the field but not sowing a crop - leave the ground bare.
 - do not fertilise the land, as wildflowers and grasses want low nutrient levels compared with arable crops.

- there is no need to graze the recipient site as the bare ground is created through cultivation.
- If there are historical features on your land, consult with the relevant authority on your proposed works, as soil disturbance to create bare ground can be damaging to buried archaeological features.
- Creating bare ground may stimulate problem weeds to grow such as thistles, docks and ragwort which may need controlling.

Active restoration / recreation

- Green hay relies on taking a hay cut just as the majority of flowering plants begin to set seed.
 - for large donor fields, or where a lot of material needs to be cut, the most practical method for harvesting is to use a tractor and forage harvester. The material can either be transferred into a muck spreader towed behind a tractor for spreading across larger

recipient fields. Alternatively, if a smaller amount of green hay is required or the material is needed in different fields, it could be transferred into the back of a trailer and spread by hand, or tied into small bales and spread by hand.

- Smaller fields, less than 1 hectare, could be strimmed. The hay could be transported and spread from the back of a trailer. This can take a longer period of time allowing the hay to heat up, and may lead to a greater seed drop in the donor grassland.
- A ratio of 1:3 should be used for donor site collected hay to spreading hay on the recipient site. As a consequence, a smaller donor field is needed compared with the recipient field.
- Any clumps of spread green hay should be scattered using pitch forks to create an even covering of green hay.
- The seeds from the green hay need to be put in contact with the soil to germinate. This can either be done by rolling the recipient field straight after the seed has been spread, or by putting out livestock, particularly cattle.
- Vegetation growth should be restricted in the autumn of the first year to reduce any competition for germinating seeds. This is particularly important in recipient fields that were already under grass as clump-forming grasses, including cock's-foot and Yorkshire fog, can be very competitive and cover newly germinating seeds. Either livestock, particularly cattle or ponies, can be put into the field to eat the grasses if they are getting high, or an extra cut can be undertaken in late autumn. Neither grazing nor cutting should be undertaken if this will cause ground problems, for example, in wet fields that may be prone to livestock poaching or compaction by heavy machinery.
- Management of the donor grassland should be undertaken as usual, treating the green hay cut as if it was a normal hay cut. If aftermath grazing is the usual management, this should be continued. The only difference between normal hay cut management and taking green hay is the timing as green hay is taken slightly earlier.
- Green hay should only be taken once every three years from donor grassland. Taking it more often may start to remove too much seed-rain from the field and it may become impoverished. The donor grassland should be treated as normal during the intervening years to maintain the wildflowers and grasses.

Post-restoration /-recreation management

- Most grassland wildflowers are perennial. Seeds germinating in the first year of restoration may only form a rosette of leaves and not flower. These plants will bloom from the second year onwards. The exception to this is yellow rattle, which is an annual flower and a hemi-parasite of grasses. It helps reduce the number and vigorousness of grasses and is a beneficial plant in grassland restoration and recreation.
- If there is a good amount of vegetation growth over the winter, put a low number of livestock back onto the recipient site in the first year following restoration. The objective is just to reduce the vegetation and not to create bare ground. Be careful that the livestock do not nibble young shoots of yellow rattle; they should be removed if this starts to happen.
- During the flowering season of April to July in the first year, do not graze the donor and recipient fields - this will allow flowers to bloom, particularly yellow rattle. This is called 'shutting-up' the fields.
- From mid-July / August onwards take a hay cut from the recipient field. Cutting the vegetation too early will remove any

yellow rattle that has grown before it has had a chance to set seed. Hay making is traditionally undertaken by mowing the field and leaving the cut vegetation to dry. It should be turned at least once a day to aid the drying process and loosen seeds allowing them to drop out of the hay. The hay is then baled and taken away for livestock fodder over the winter.

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- Leaving wide margins uncut around the edge of the fields will provide nectar and pollen for pollinators (bees, hoverflies, beetles, wasps etc.) over the summer and early autumn. Also, cutting hay across the field, or from the centre outwards, allows insects and animals to escape; cutting around the outside of the field first can trap wildlife in the uncut field centre.

- Once the grass has started to re-sprout, it should be grazed by livestock. This is termed aftermath grazing and helps to control the grasses that can be more vigorous than wildflowers.
- If pasture management is desired, the recipient field should be shut-up between April and July/August, followed by livestock grazing into the autumn.
- Livestock should be removed in the autumn if the fields become wet to prevent poaching the ground. An early spring graze could be undertaken if there has been grass growth over the winter period but livestock should be removed for the 'shut' period to allow wildflowers to grow and bloom.

Green hay is an excellent method of preserving the local identity of wildflower grasslands. It is also an effective method of enhancing the wildflowers in a species-poor field. A concern using green hay is that early flowering plants may have already shed their seeds and late flowering plants may still be in flower when the green hay is taken. These plants are missed, and additional enhancement of specific wildflowers may be needed in the future.

For more information see Natural England's [TIN063 Sward enhancement: diversifying grassland by spreading species-rich green hay](#).



Restoring species-rich grasslands using green hay timeline

