

## How do I know if my meadow restoration or recreation is succeeding?

It is useful to know if your meadow restoration is progressing in the right direction and succeeding. This is a process towards a stabilisation of species in the meadow. A successful restoration can take a long time, over 15 years for some of the species to establish and start to bloom. A succession of species may grow, particularly in the first few years following seed introduction. Although this can be alarming as only one species seems to be present in the field, it is usually part of a natural progression towards a stable wildflower meadow. These flowers can also be used as indicators to assess whether restoration or recreation is progressing in the right direction (termed positive indicators) or in the wrong direction and perhaps other restorative work needs to be undertaken (termed negative trends).

The process of stabilisation depends on a number of factors including the type of meadow that you have been working towards, such as neutral, calcareous or acid grassland, and the donor seed, such as green hay, brush harvested seed or a seed mixture.

The guidance below outlines the succession of species and can be used to identify possible trends. However, succession may not follow the precise pattern suggested below and could take a few years before visible signs of restoration are apparent. Patience is required and a successful restoration is a long-term goal. The guidance covers all three types of grasslands; [neutral](#), [calcareous](#) and [acid](#) grassland.



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## Neutral grassland

### Hay meadows (dry neutral grassland)

Hay meadows are the most commonly restored type of grassland using green hay, brush-harvested seed or a seed mixture. They are species-rich and feature meadow buttercup, yellow rattle, oxeye daisy, common knapweed, field scabious, bird's-foot trefoil, meadow vetchling, self-heal, red clover and ladies bedstraw in lowland grasslands. Upland grassland has a distinctive flora with wood crane's-bill often being a notable feature.

### Floodplain meadows (wet neutral grassland)

Floodplain meadows are similar to drier hay meadows with many of the same flowers. However, a few distinct differences are the presence of greater bird's-foot trefoil, cuckoo flower, meadowsweet, ragged-robin, pepper-saxifrage and great burnet, along with rushes (particularly jointed rush) and in damper areas marsh marigold.

### Succession of neutral grassland plants following re-seeding

After seed introduction, there is often a sequence of species succession which may result in yellow-rattle being prominent for the first one to ten years, followed by a flush of oxeye daisy in years two to four and a flush of legumes in years three to six. The prominence of these species in these periods is not a concern, and shows that the habitat structure is moving towards a hay meadow. For example, yellow rattle can take a while to establish, and may not be prominent in the first few years, although it can become dominant for several years following its introduction, particularly where the coverage of grasses is high. Yellow rattle usually starts to decrease after a few years, but can still be very dominant ten years after introduction. If this is of concern, for example it reduces the hay crop to a level that is too low to make harvesting economical, then some of the meadow could be cut earlier in the year, around June. The management will reduce the amount of yellow rattle that can mature

and set-seed, resulting in fewer plants the following year.

Oxeye daisy is another flower that can bloom and appear to take-over in the first few years after re-seeding. It is a quick germinating, short-lived perennial species with individual plants surviving between 2-10 years. The seeds need to touch bare ground to survive and so it often takes advantage of the 50-75% bare ground created during the site preparation prior to reseeded. As individual plants start to die and the amount of bare ground reduces, oxeye daisy will decline and the population stabilise.

Green hay used for re-seeding may have been taken at a stage where some plants have already shed their seed, whilst others are only just coming into flower. For example, cowslip is early flowering and has shed seed long before other meadow plants such as yellow rattle are ripe. Devil's-bit scabious is at the other end of the spectrum often flowering later than many other plants. There is a single window of opportunity to get the greatest number of species transferred from the donor to the recipient site. Green hay needs to be taken at the point when most of the flowering plants have set seed but the seed has not been dropped from the seed heads. Brush-harvested seed collected using a single sweep of the donor meadow may limit the seeds present in a mixture and be less diverse than seed collected using two or more sweeps of the donor meadow. Plants that are thought not to be present in the seed mixture can be added by using specific seed or plug plants grown for later introduction. Plug plants may also be a better method of introducing species that are difficult to establish from seed, such as marsh marigold.





## Calcareous grassland

Calcareous grasslands can be the most species-rich of all grasslands, with plants such as bird's-foot trefoil, wild basil, wild marjoram, common and greater knapweed, oxeye daisy, salad burnet, field and small scabious, lady's bedstraw, ribwort and hoary plantain, kidney vetch and sainfoin. Typically, calcareous grasslands are managed as pasture but they may be managed as hay meadows in certain locations when the opportunity presents itself. They tend to be dry grasslands and plants at any wet flushes tend to be similar to those found in the wet neutral meadows.

### Succession of calcareous grassland plants following re-seeding

In restorations, the succession of calcareous grassland plants follows that of neutral grasslands, with the exception of yellow rattle which may not have been present in the green hay, brush harvested seed or included in the species mixture. It may be added initially to encourage a reduction in grass coverage but under a pasture regime, where grazing is often undertaken slightly earlier in the year than with hay making, the tops of yellow rattle plants are eaten and it is unable to set seed and so dies out.

To help establish calcareous grassland, a high level of bare ground needs to be created. Legumes, particularly kidney vetch, sainfoin and bird's-foot-trefoil can establish quickly providing a flush of colour in the first few years.

Some plants seem to have a delay in establishing. For example, yellow-wort appears to take a few years to establish. Patience may also be required for some of the orchid species. The seed is very small and easily carried on the wind, and some orchid species require fungal interactions to germinate and establish. Thyme, salad burnet, mouse-ear hawkweed and rock-rose may be harder to establish as the seeds are difficult to collect and they are very particular, preferring thinner parched soils.

Other later successional plants are also important. For example, [juniper](#) trees are a feature of open calcareous grassland. They have very specific germination requirements, requiring bare ground, and the presence of male and female plants are required to make viable offspring. Otherwise cuttings can be taken and grown as plug plants.



## Acid grassland

### Dry acid grassland

Acid grassland tends to be relatively flower-poor and grass-rich. This is particularly true of dry acid grasslands that feature sheep's sorrel, tormentil and heath bedstraw with grasses such as wavy hair-grass, heath wood-rush and fescues. The habitat can often form a mosaic of grassland and heathland with heather (ling) and bell heather present and in southwest England there might be Cornish heath. Usually, restoration of dry acid grassland is undertaken together with heathland restoration.

### Wet acid grassland

Wet acid grassland includes culm / rhôs pasture and is flower-rich compared with dry acid grassland. Flowers are a feature of wet acid grassland include greater bird's-foot trefoil, ragged-robin and devil's-bit scabious with regional variations, such as sneezewort

in Devon and whorled caraway in Wales. The vegetation is often dominated by purple moor-grass with sharp-flowered rush and jointed rush, common sedge and carnation sedge and in wetter areas verging into mires cotton-grasses.

### Succession of acid grassland plants following re-seeding

It is uncommon to restore dry acid grassland through re-seeding and, as a consequence, there are no details of the succession of vegetation following sowing. Wet acid grassland is usually only undertaken where there are underlying hydrological conditions that maintain the damp habitat. However some plants, for example devil's-bit scabious which may be found in neutral and calcareous grassland, and ragged-robin which can be found in neutral floodplain meadows, are often found in seed mixtures and may be collected from donor sites with green hay or as part of brush-harvested seed.



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