

Meadow enhancement - plug plants

Following restoration, the diversity of a meadow can be enhanced by adding either seed or plug plants. This leaflet covers plug plants. See the meadow enhancement leaflet covering seed for more information on this technique.

Restoration does take time, and in the first few years that can be peaks of particular species, such as yellow rattle, oxeye daisy and legumes. These can be part of the [natural ecological succession](#) and it is best to wait for these flushes to level off and the meadow to

become more uniform. However, there may still be species that are missing. Sometimes this is because they are late successional meadow plants with a long dormancy period, so patience is required following re-seeding.

After at least 10 or more years you may find that there are some plants missing from your meadow that you would have expected to have germinated. This can occur for several reasons depending on the type of restoration and seed source you have used. For example:



© Somerset Wildlife Trust

- if you used green hay it may have been taken from a seed source with a low population of the species, and as a consequence there may not be a lot of seed of the missing species present in the original mixture, or the species may not have set seed by the time of harvest and spreading which is the particular problem of early flowering species such as primrose, or late flowering species like devil's-bit scabious;
- if you are using brush-harvested seed it might be that the seed was not dried properly, or stored in suitable conditions before sowing, both of which reduce the viability of the seed;
- seed mixtures can be relatively species poor compared to green hay or brush-harvested seed, as it costs a lot more to buy a more diverse mixture and funding can be a limiting factor in many restorations;
- one further additional factor affecting the establishment of plants is the local site conditions, particularly the soil nutrient levels. Many wildflowers do not like high soil nutrients and are unable to survive. If a plant has not established because the site is not suitable then a plug plant will not survive in the long term.

There are several steps involved for adding plug plants to a meadow - sourcing seed, growing the plug plants, transplanting and aftercare.

Sourcing seed

Seed can be sourced from a number of places. There is some evidence that there are genetic differences between populations of the same species, plants growing from locally sourced seeds perform better in terms of flowering compared with plants grown from distantly sourced seeds, and that insect populations are more adapted to locally sourced plants. Choosing seed of local origin or collecting your own seed is highly recommended.

Single species can be bought from some suppliers. See the [Code of Practice](#) for reputable seed suppliers of native flora and usually they have an origin location for where the original source seed was collected. If you are planning on growing a lot of seed, it may be reasonable to work with a local nursery if they will undertake this process for you.

If you plan on collecting seed you must have the landowner's permission and do not collect seed from endangered species. The seed should be collected when it is ripe and needs to be clean as debris may harbour diseases. It also needs to be dry so collect on a warm sunny day after any dew has evaporated. Damp seeds can quickly rot. Store collected seed at 4°C, such as in a domestic fridge, within a paper or cloth bag. Seed stored in a plastic bag may become damp with condensation, which will affect the viability of the seed.

Most seeds need to be vernalised, a process of freeze and thaw, and sown before they will germinate. Sometimes several periods of freezing are required to break seed dormancy. Scarification of the seed surface to help water penetrate the skin and trigger germination, may be necessary for particular species, such as meadow crane's-bill and possibly for other species of the same genre (crane's-bills and stork's-bills).





Growing plug plants

The soil used in the seed trays should be as similar as possible in terms of the pH and nutrient levels to the receptor site. Many wildflowers do not like high nutrient levels, and so conventional seed compost may not be suitable; a low level nutrient compost should be used. Peat should be avoided. If practical, collect some soil from the receptor site to mix into the seed compost as it will contain native biota and will help habituate the seedlings to the environment. Also, if the soil of the receptor site is free draining make sure that this is mimicked by the soil used for the plug plants, but if it is wet make sure that you water the seed trays slightly more frequently rather than using a water retentive soil as this can cause seeds to rot.

Press the compost flat into clean plastic pots or cells and sow the seeds thinly onto the soil surface. If the seed is small mix it with a little dry sand to help sowing. Cover the soil surface with a very thin layer of sand or fine grit to help retain moisture against the seed. At most this should be 5 mm thick so that it replicates natural conditions where seed is

shed on the soil surface and may be trodden into the ground.

Seed trays should be put somewhere outside, in the light but protected from heavy rain. The pots or cells should be watered from below, but should not be waterlogged so avoid putting them into trays which might accumulate standing water from rainfall.

Seed sown between October and January should get plenty of natural freeze and thaw to trigger germination. The surface layer of thin soil or gravel should protect the seed from rainfall and stop desiccation, but keep an eye on the trays and move to a more protected location in severe weather or water if it is dry. Pots and cells can dry out much more quickly than garden soil so this is something to look out for.

Most seed will germinate from March onwards. Seedlings may need to be pricked out of pots and separated when the first true leaves appear. The best way to do this is to use a tool to lift the seedling from below whilst holding a leaf. Do not hold the stem as you will risk crushing the fragile flesh and the plant will wilt and die. Try to get as much of the roots as possible as the small roots have hairs that take in nutrients and water. Plant into similar compost, one that is low in nutrients and relatively free draining. If cells have only been sown with 2-4 seedlings each then these can be left to grow until they are root bound and ready for planting out.

Planting out (transplanting) plug plants

The plugs can be transplanted between May to June once they have a few more true leaves. The pots should be inverted from below to produce the plug of soil and root-ball which is ideal for transplanting directly into the recipient site.

When it comes to digging a hole for the plug, there are two schools of thought:

- i. dig a hole approximately the same size and depth as the plug and inset the plug (possibly teasing out a few roots to help the plug root into the soil); or

- ii. dig a hole that is larger but the same depth as the plug. The plug is put into the hole (teasing out a few roots) and the surrounding area is filled in with earth.

The second process may help plants to establish as it will take a while for vegetation to grow into the newly turned soil. However, it is not practical on every site as it increases the amount of work and creates lots of circles of bare ground surrounding plug plants. Where competition for light is thought to be a potential problem then the second method is practical, but where it is not through to be a problem the first is the better option.

Whichever method you use, ensure that plugs are well firmed in so that the roots are touching the soil.

Caring for plug plants following transplantation

After transplantation the plugs should be watered in. Additional watering will be required for at least six weeks during dry spells whilst the roots establish. It might be useful to mark the location of plugs when they are being planted out to make aftercare easy. Drought is the commonest cause of plug plant failure.

Another cause of failure is slug and snail grazing and seedlings are very susceptible to damage. Some form of control may be required to help them mature to a size where they are robust enough to survive.

The vegetation immediately surrounding the plugs should be kept short in the first year after planting out. This reduces the competition for the young plants enabling them to establish better. This management can be achieved by cutting or short periods of grazing, but you may find that the latter also removes the flowers of other plants especially in a hay meadow. Grazing should not be undertaken for at least six weeks following transplantation to enable the plugs to root securely.

Most meadow plants are perennial (with the exclusion of yellow rattle and a few others) and usually establish a basal rosette of leaves in the first year and do not flower. Some meadow plants take a long time to develop a flowering stem, whilst others are much quicker to develop, such as oxeye daisy; so do not be surprised if you do not see any evidence of the plug plants for a few years.

Depending on the type of grassland, you will want to follow either a [hay making or grazing pasture regime](#) for the wildflowers to thrive.

Success rates

Even with good seedling germination, delicate transplantation of the fragile plugs and suitable aftercare, the success of plug plants can still be low. There is a high mortality rate with transplantation. It can also be quite expensive and take considerable time. As a consequence, plug plants are only recommended as an enhancement mechanism to establish 'missing' species after a restoration has been undertaken rather than being the main restoration activity.

