

Agriculture

Tailored advice on managing land for pollinators



Who is this information for?

Relevant for all involved in agriculture and horticulture, including farmers, growers, landowners, estate managers, contractors and farm advisers.

Why are pollinators important?

Insect pollinators are important for food production, as well as biodiversity. Yield and quality of food produced by many crops worldwide, is dependent on pollination by insects¹. In the UK, the value added by insect¹ pollination to crop production has been estimated at several hundred million pounds². Insect pollination is also necessary for seed production by many wild plants.

Pollinating insects include honey bee, bumblebees, solitary bees, wasps, hoverflies and other flies, butterflies, moths and beetles. Honeybees have an important role in pollinating crops; they can easily be moved in hives to locations near crops, and provide a readily accessible pollinating service. The British Beekeepers Association (<http://www.bbka.org.uk/>) and the Bee Farmers Association (<http://www.beefarmers.co.uk/>) provide advice and support for beekeepers and can help to put farmers and beekeepers in contact with each other.

Healthy populations of wild pollinators are also needed to ensure high levels of crop pollination because for some crops, honeybees are not the most effective pollinators. Research has also shown that numbers of honeybees are not sufficient to pollinate all crops^{3,4,5}. Where studies that have identified species important for crop pollination, they are mostly managed or wild bee species¹.

Pollinators are essential for biodiversity and the wider environment. They maintain the diversity of wild flowers and support healthy ecosystems, particularly by helping plants to produce fruits and seeds which birds and other animals rely on. Also, they are valued by the public, and, as part of our natural world, contribute to our health and well-being.



Since the 1950s, the distributions and diversity of some wild pollinator groups have changed in Britain, with many species declining or even disappearing from large parts of the country. It is important to take action to support populations of insect pollinators into the future.

What do pollinators need?

Different types of pollinating insects have different requirements. All of them feed on nectar (which provides energy in the form of sugars) as adults and many also feed on pollen (which provides protein). Bees also feed their larvae on pollen and nectar. Hoverflies have particularly varied life-cycles and the larvae of many feed on crop pests such as aphids, making these insects doubly useful. Butterfly larvae (caterpillars) feed on plant leaves and different species need different larval host plants.

In addition to their food requirements, pollinating insects need the right sort of habitat to complete their life cycle. Bees in particular need suitable places to make their nests, which may be below ground (mining bees and many bumble bees), in dense vegetation on the surface

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(carder bumblebees), or in holes in logs, plant stems, walls etc (e.g. mason and leafcutter bees). Pollinating flies rely on pools, ditches, damp soil and animal dung for their larval development.



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How important is farmland for pollinators?

Pollinators are important for agriculture, but agriculture is also important for pollinators. Farming is carried out on 71% of the UK land area⁶, so the management of agricultural land is very important for maintaining pollinator populations. Crops such as oilseed rape provide food for pollinating insects⁷, but only for a short period of time, so other food sources such as blossom-rich hedges, unimproved grassland, and flowery field margins are needed to maintain them for the rest of the year. Breeding and overwintering habitats such as grassland, hedgerbanks, ditches, pools, dung-rich pasture and bare ground are also important.

Organic farming is particularly valuable for pollinators. Evidence shows that organic farms support, on average, 50% more species of pollinators than non-organic farms⁸. This is due to:

- the increased abundance and species richness of wild flowers in organic fields⁹ and the increased level of uncropped habitats (such as hedgerows) found on organic farms¹⁰,
- reliance on crop rotations and mixed farming³, providing a greater variety of food sources across the farm over the seasons;
- the use of clovers and other legumes on grassland to increase soil fertility¹¹, but which are also attractive to pollinators and may be important in reversing declines in many bumblebees¹².

Whilst these individual practices can help improve conditions for pollinators, it is the combination of wild flowers, rotations, legumes and uncropped areas that makes organic farming systems good for pollinators.

What you can do

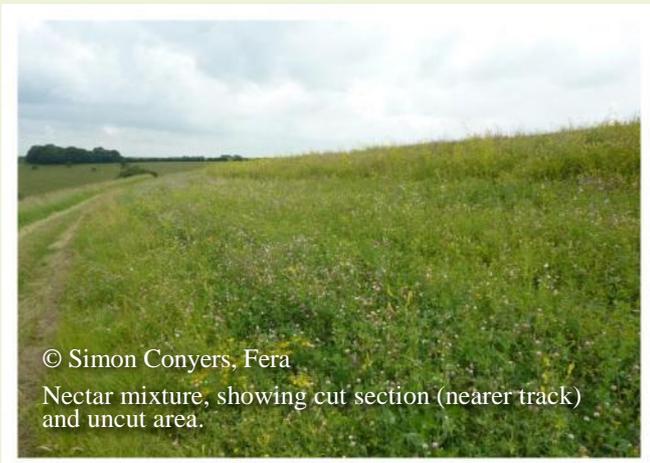
Encourage wild flowers

The demands of society for cheaper and more reliable food supplies has encouraged intensification of agriculture and horticulture, with greater use of herbicides and artificial fertilisers to increase crop yields and quality and more intensive grassland management for silage etc. As a result, the abundance of wild flowers within crops and grasslands has decreased¹³. Providing high density floral resources can help to offset the impact of these losses. Many wild flowers that grow in field margins, hedge banks, woodland edges and wet areas are valuable sources of forage for pollinating insects. These include common species such as hogweed, cow parsley, knapweeds, clovers and vetches, as well as the flowers of hedgerow shrubs themselves, while ivy is important at the end of the season. Where these plants are present, leave margins at least 1-2m wide between the hedge or other field boundary and the crop, and be careful to avoid spray drift into these areas. Margins should not be cut during the flowering season and only in the autumn and winter when necessary to prevent scrub formation. Flowering arable plants such as mayweeds, poppies, fumitories, sowthistles, dead-nettles can also be valuable sources of nectar and pollen in field edges or corners. Species-rich grasslands are now rare, but if they are present on the farm they should be recognised as a valuable habitat and managed to encourage the wildflowers. In particular, nitrogen fertiliser should be avoided as this stimulates competitive grasses which will soon exclude the wildflowers.

Growing flowers for pollinators

Floral resources can be enhanced by sowing flowers along the edges of fields or in field corners¹⁴. Suitable mixtures can be obtained from several seed companies that specialise in mixtures for environmental purposes. These can increase the numbers of pollinators, such as bumblebees, in the landscape¹⁵. Payments were available in England for establishing flower mixtures under Environmental Stewardship, but this is now closed. The new agri-environment scheme opens in 2015, with the first agreements starting in 2016. If you don't have an Environmental Stewardship agreement, you can still provide floral resources through voluntary management.

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Nectar mixture, showing cut section (nearer track) and uncut area.

It is a good idea to seek advice, in order to ensure the right measures are put in the right place and managed in the right way. Advice and support is available from the Campaign for the Farmed Environment, which gives details of several voluntary measures to benefit pollinators (<http://www.cfeonline.org.uk/campaign-themes/pollinators/>).

Short-term rotational mixture

- 'Pollen and nectar' mixtures containing mainly agricultural varieties of legumes (e.g. clovers) and other suitable plants are particularly attractive to bumblebees^{14,15,16}. Natural England recommend red clover, alsike clover, bird's-foot-trefoil, sainfoin, musk mallow, and common knapweed¹², but not grasses since these compete with the legumes. .
- Sow onto a firm, fine seed bed in either mid March – end April or August, and cut at least twice in the first year to suppress weeds.
- Once established, manage by cutting in September, ideally removing the cuttings to prevent smothering of the sward and to reduce fertility, which helps to maintain and enhance floral diversity. If possible, cut half the area in late June where red clover is dominant, to encourage fresh growth and new flowers to meet peak demand from bees. However, farmer experience has shown that where knapweeds are the main flowering species, this should not be done as they don't respond so well to cutting.
- Pollen and nectar mixtures often need replacing after around 3 years and can be rotated around the farm,

as grasses come to dominate and the legume components decline^{18,19}.

- Wild bird seed or game cover mixtures that are either annual or biennial can provide valuable pollen and nectar sources²⁰, and can be enhanced for pollinators by adding species such as sunflower, borage and fodder radish.

Long-term perennial mixtures

- An alternative approach is to sow longer term wild flower mixtures^{14,15,16}. These may not provide the same density of flowers as the 'pollen and nectar' mixtures, but they can flower over the whole season if suitable species are included, and benefit a wider range of pollinators.
- They are more expensive but, as they last longer (up to 10 years or more), the cost evens out over time. They can be used in field margin strips or buffer strips along watercourses.
- Flower species recommended by Natural England include knapweed, wild bird's-foot trefoil, self-heal, oxeye daisy, yarrow, wild red clover and wild carrot¹⁷. Additional species with high nectar production per unit area include bugle, marjoram and field scabious. These need to be appropriate and sensitive to local soils and vegetation communities – marjoram and carrot for example grow best on calcareous soils, neutral or acidic soils need different species. Seek advice as to the best pollinator plants for your area. Inclusion of yellow rattle, which is parasitic on grasses, can help to reduce the vigour of the grass and make it less competitive with flowering herbs. If grasses are sown with the flowers, these should be fine leaved grasses such as red fescue, crested dogstail and common bent. Avoid coarse grasses such as cocksfoot and timothy, which are competitive and will smother the flowering herbs.

Improved grassland

On grassland farms, legume and herb-rich swards can be created and managed as temporary grassland by sowing the grasses with clovers, bird's-foot trefoil and herbs such as oxeye daisy, yarrow, forage burnet, and knapweed²¹. The swards can be managed by cutting or grazing, but management should allow flowering of the legumes and herbs to provide forage for the pollinators.

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Case study: Upton Estate Farm

Upton Estate sits on the Oxfordshire/Warwickshire border between Banbury and Stratford Upon Avon. It covers 2,000 acres and has a working farm. The Estate has recently dedicated around 10% of the land area to the propagation of wildlife. Many of these habitats deliver specific gains for pollinators including: perennial wildflower mixtures, tussocky grass and legume mix. In addition, in the borders of the estate's woodland, 'scallops' have been cleared, providing patches of bare soil for butterflies moths and solitary bees. Two new species were recorded on the legume mix; the rare bumblebee *Bombus ruderatus* and the Marbled White butterfly.

B. ruderatus has responded well to sown legume mixtures on other farms too, demonstrating the potential for high quality habitats to deliver benefits for rare species.



Spring and late summer forage

- It is important to provide flowers throughout the flying season, from March to October. Spring flowers provide food for bumblebee queens after they emerge from hibernation, when they need to build a nest and lay their eggs, and also for early flying solitary bees.
- Spring-flowering shrubs such as blackthorn, hawthorn and trees such as crab apple and willows are valuable early sources of nectar and pollen, along with herbaceous species like white dead-nettle ‡ and ground ivy. Managing hedgerows on rotation to allow flowering can increase the amount of forage available.
- In late summer and autumn, ivy can be a valuable source in addition to late flowering herbs such as knapweed and teasel. These will provide forage for queen bumblebees preparing for hibernation.

Defra and Natural England have produced a DVD entitled 'Growing Farmland Wildlife', giving practical guidance on how to get the most out of sown flower margins and other wildlife habitats, such as choice of location, scale, seed mixture and rotation. Contact Natural England enquiries for a copy (<http://publications.naturalengland.org.uk/publication/608078>).

Providing nesting and hibernating sites for bees

Bumblebees will nest at ground level in dense vegetation or underground, often in disused mouse holes. Tussocky grass banks in field margins or next to hedgerows can provide good nesting and hibernating habitat. Avoid 'over tidyness' in managing such habitats, and leave them uncut or cut in rotation so that some vegetation is left overwinter. Some solitary bees nest in hollow stems or in holes in wood. Leaving dead stems of bramble and dead tree branches etc. where possible can provide nest sites for these species. Other species such as mining bees use bare ground, e.g. sandy banks or south-facing short turf. Creating such areas, or leaving them undisturbed where they already exist, will benefit these species¹¹.

Managing crops

Studies are ongoing to help us better understand the effects of pesticides on wild and managed pollinators, including neonicotinoids²². Space does not permit a detailed examination of this issue, but it is important to think carefully before applying insecticides and they should be used as little as possible during the insect flight period, i.e. between March and October. Spraying should be avoided when bees and other insect pollinators are active within crops.

Wherever possible, the principles of integrated pest management should be applied†. In particular, pests should be monitored, and the results should be used to decide whether and when to use insecticides‡. If application is unavoidable, consider the different products that are available, use the least persistent and most specific product, and take care to avoid spray drift. Encouraging natural enemies of pest species e.g. by the presence of grass margins around fields, can reduce the need for insecticide application²³.

† http://www.leafuk.org/leaf/farmers/LEAFs_IFM/Whatisifm/IPM.eb

‡ <http://www.voluntaryinitiative.org.uk/en/vi-schemes/ipm-plans>

<http://www.hgca.com/crop-management.aspx>

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Conclusion

It is vital that insect pollinator populations are healthy, to ensure good pollination of crops and hence maximise crop yield and quality. By following the advice in this information sheet, encouraging wild flowers, sowing seed mixtures and providing a diversity of breeding habitats, you will be helping to improve the status of pollinators in the countryside, thus ensuring sustainable insect pollination for agriculture and horticulture into the future.

The advice contained within this information sheets is evidence-based as far as possible. Experts from Government and a wide range of interested organisations, including research scientists, have helped to inform the development of this detailed advice. It is intended as good practice advice and should not be regarded as official guidance. Many other organisations also provide advice on managing your land for pollinators, and links have been provided here where appropriate. Klein, A-M et al (2007). Importance of polinators in changing landscapes for world crops. Proceedings of the Royal Society B, 274, 303-313.

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