

## Managing farmed landscapes for pollinating insects

Increasing floral resources and improving habitat conditions can benefit pollinating insect species, wildflowers and crop production.



Photo by Claire Carvell

**Living With Environmental Change  
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**The Living With Environmental Change Partnership** brings together 22 public sector organisations that fund, carry out and use environmental research and observations. They include the UK research councils, government departments with environmental responsibilities, devolved administrations and government agencies. The private sector is represented by a Business Advisory Board.

**Pollinating insects in the UK include the managed honeybee and hundreds of species of wild bumblebee, solitary bee, fly, butterfly and moth. They support food production and biodiversity by pollinating crops and wildflowers. Insect pollinators face multiple threats in farmed landscapes, including the loss of wild habitats, agrochemicals, climate change and disease. Land management to increase floral resources and improve semi-natural habitats, such as using agri-environment schemes, can benefit both pollinators and crop production.**

## **Why are pollinators important in farmed landscapes and what resources do they need?**

**Pollinators play an important role and have a range of needs:**

- Insect pollinators improve or stabilize the yield and quality of three-quarters of crop species worldwide, and are important for biodiversity, helping maintain wild plant populations that provide shelter and food for wild animals.
- Pollinators feed on nectar as adults (providing energy) and many also feed on pollen (providing protein).
- Most pollinator species collect food from a broad range of flower species to meet their particular nutritional needs, whereas some specialise, collecting food from a few or a single plant species.
- Bees feed their larvae on pollen and nectar. While some species are active from March to October, others are only foraging for a few weeks. A diverse bee community requires a continuous succession of flowers to maintain food supplies over time.
- The offspring of some pollinators depend on leaves and insect prey, rather than flowers. For example, certain hoverfly larvae hunt aphids, while butterfly larvae (caterpillars) eat the leaves of various host plants.
- Flowering crops, such as apples or oilseed rape, provide abundant nectar and pollen for short periods, but wild plant sources (eg from field margins and hedgerows) are required to sustain the food supply for pollinators. For example, the mining bee *Andrena dorsata* is a key pollinator of apples blooming in spring, but its second summer generation needs later-flowering plants to survive.
- Pollinators need suitable places to nest, mate and hibernate over winter. These may be underground (solitary mining bees and bumblebees), in dense tussock vegetation (carder bumblebees) or in cavities (mason and leafcutter bees). Some pollinating flies need damp and wet areas, or animal dung, during their larval stages.

## **How much habitat is enough for wild pollinators?**

**The amount and spatial arrangement of flower-rich habitats can affect the population size and foraging behaviour of pollinators. Measuring the size of pollinator populations is extremely difficult, but recent research has shown that:**

- Nests of most common bumblebee species occur at a minimum density of 10 – 35 nests per 100 hectares. There is evidence for some bumblebee species of higher nest densities on farms with agri-environment schemes that provide suitable flower resources.
- An estimated 2% flower-rich habitat (equal to 2 hectares) and up to 1 kilometre of flowering hedgerow in every 100 hectares of farmland can supply enough pollen to support populations of six common wild bee species.
- Food resources need to be available within foraging distance of the nest, usually averaging between 100–1000 metres, but this may range from tens of metres (small solitary species) to several kilometres (bumblebees and honeybees). To achieve this across an agricultural landscape patches of flowers should be at least 0.25 hectares in size and no further than 250 metres apart.
- Increasing the amount of flower habitat in farmed landscapes reduces the distance that bumblebees have to fly from their colony to find food, meaning they can devote more energy to raising healthy queens that survive the winter.



## How can habitats for pollinators be enhanced at the landscape level and what are the benefits?

**Pollinators operate at scales larger than individual farms, so management needs to be coordinated at a landscape scale and targeted at the needs of conservation priority species:**

- Enhancing food resources for pollinators can increase their numbers and diversity at the landscape scale and locally. Steps include sowing or maintaining floral resources, including “weedy” species such as deadnettles and thistles, both in-field and along boundaries.
- Flower mixtures are most effective if sown in landscapes where existing floral resources are scarce, although they are likely to provide benefits in all landscapes.
- Sown flower patches or strips along lower yielding field edges can increase both pollinator numbers and crop yields, as demonstrated in important crops such as field beans and field-grown blueberry, although such yield benefits can take a few years to develop as the enhanced pollinator community establishes.
- A mixture of habitats such as grassland, hedgerow, woodland and scrub (providing both food and nesting resources) in the landscape surrounding farms, often increases wild pollinator diversity and crop pollination services.
- Providing a diversity of nesting resources (short turf, bare ground, plant stems, logs, ditches) may increase pollinator numbers.
- High quality habitats for pollinators can also help other beneficial species such as ground beetles and hoverfly predators of crop pests.
- Priority or rare pollinator species (eg Section 41 species in England) are targeted (where they occur) through the new agri-environment schemes, with detailed guidance on the best management approaches to meet their specific habitat requirements.

## What strategies at national level could encourage pollinating insects and enhance crop pollination?

**Policy makers at national level need to:**

- Incentivise greater agri-environment scheme uptake. In England, the new Countryside Stewardship scheme targets wild pollinators through the Wild Pollinator and Farm Wildlife Package: a bundle of options that, together, provide the essential resources that pollinators need throughout the year. Applications containing management options from the Wild Pollinator and Farm Wildlife Package score highly and are more likely to proceed to an agreement offer.
- Incentivise joint applications from farms for agri-environment or other financial support, to manage entire landscapes for pollinators (eg the new Countryside Stewardship Facilitation Fund).
- Protect and extend the area of semi-natural habitats such as woodlands, heathlands and meadows within the landscape, for example via Biodiversity Action Planning, Nature Improvement Areas and Higher Tier Countryside Stewardship.
- Extend opportunities for training farmers on establishing and managing pollinator habitats, eg. via the Campaign for the Farmed Environment and agricultural colleges, since this has been shown to improve the quality of habitats delivered.
- Monitor uptake, quality and delivery of agri-environment schemes and voluntary initiatives both on-farm and at national levels, and adjust options on the basis of new evidence. Simple measures of habitat quality may offer a rapid assessment tool for land managers.
- Adopt UK-wide systematic monitoring that uses standardised methods to track changes in the status of pollinators and pollination services.

## What strategies put in place by land managers and advisers could encourage pollinating insects and enhance crop pollination?

### Land managers and land advisers can help by:

- Being aware of the range of options (eg Ecological Focus Areas) within the mandatory greening measures under the Common Agricultural Policy, which can provide flower-rich habitats like grassland or scrub.
- Providing pollinator resources throughout the season, for instance: sowing a mix of summer-flowering legumes as well as diverse mixes of perennial wildflowers alongside managed hedgerows (cut on a three-year rotation) and trees (eg willow) to provide important spring forage, and leaving verges or ivy uncut to provide late summer flowers.
- Wherever possible, ensuring that management of priority and semi-natural habitats accounts for the life cycle needs of wild pollinators, eg providing heterogeneity by varying grassland sward height or with sympathetic management of scrub habitat.

## Further information

**This Policy and Practice Note was written by Dr Claire Carvell, Dr Matt Heard, Dr Adam Vanbergen, Prof Andrew Bourke and Dr Lynn Dicks. It draws on the Insect Pollinators Initiative research project "Investigating the impact of habitat structure on queen and worker bumblebees in the field". The Insect Pollinators Initiative was funded by the Biotechnology and Biological Sciences Research Council, the Department for Environment, Food and Rural Affairs, the Natural Environment Research Council, the Scottish Government and the Wellcome Trust under the auspices of the LWEC partnership. The authors thank James Phillips (Natural England) and Dr Seirian Sumner for comments on the text.**

### Useful resources:

Insect Pollinators Initiative: [www.insectpollinatorsinitiative.net](http://www.insectpollinatorsinitiative.net)

Dreier, S., Redhead, J.W., Warren, I., Bourke, A.F.G., Heard, M.S., Jordan, W.C., Sumner, S., Wang, J. & Carvell, C. (2014) Fine-scale spatial genetic structure of common and declining bumble bees across an agricultural landscape. *Molecular Ecology* 23:3384-3395.

Dicks, L.V., Baude, M., Roberts, S.P.M., Phillips, J., Green, M. & Carvell, C. (2015) How much flower-rich habitat is enough for wild pollinators? Answering a key policy question with incomplete knowledge. *Ecological Entomology*, 40, S1, 22-35 (open access) DOI: 10.1111/een.12226

Redhead, J.W., Bourke, A.F.G., Dreier, S., Heard, M.S., Jordan, W.C., Sumner, S., Wang, J. & Carvell, C. (in press) Effects of habitat composition and landscape structure on worker foraging distances of five bumblebee species. *Ecological Applications*: DOI: 10.1890/15-0546.1

Pywell, R.F., Matthew S. Heard, M.S., Woodcock, B.A., Hinsley, S., Ridding, L., Nowakowski, M. & Bullock, J.M. (2015) Wildlife-friendly farming increases crop yield: evidence for ecological intensification. *Proc. R. Soc. B* 282: 20151740; DOI: 10.1098/rspb.2015.1740

Countryside Stewardship in England (Wild pollinator package within section 6.3): <https://www.gov.uk/guidance/countryside-stewardship-manual>

Defra's National Pollinator Strategy:

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/409431/pb14221-national-pollinators-strategy.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/409431/pb14221-national-pollinators-strategy.pdf)

Campaign for the Farmed Environment (CFE):

<http://www.cfeonline.org.uk/campaign-themes/pollinators/>

The whole series of LWEC Policy and Practice Notes, including those drawing on the Insect Pollinators Initiative may be downloaded from

<http://www.nerc.ac.uk/research/partnerships/lwec/products/ppn/>

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