

A helping hand

26 August 2016

Managing farmland to encourage pollinating insects can boost crop quality and yield, report Claire Carvell, Adam Vanbergen and Lynn Dicks

There are a number of pollinating insects in the UK, including the managed honeybee as well as hundreds of species of wild bumblebee, solitary bee, fly, butterfly and moth, all of which support food production and biodiversity by pollinating crops and wildflowers. Over the last 5 years, the [Insect Pollinators Initiative](#) has been researching how to encourage thriving pollinator populations in farmed landscapes.

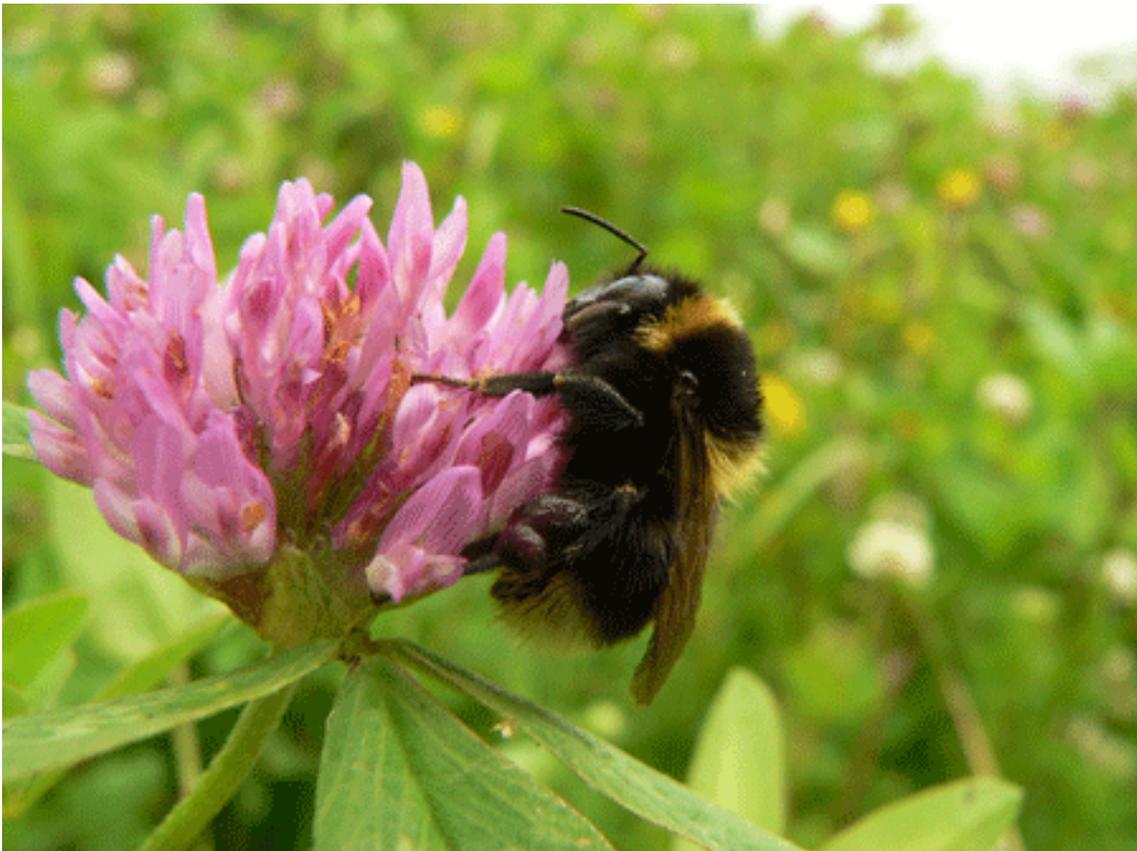


Figure 1: Queen of *Bombus ruderatus*, a nationally rare bumblebee species, which has responded well to clover-based flower mixtures sown under agri-environment schemes

Insect pollinators face multiple threats in these areas, including the loss of wild habitats,

agrochemicals, climate change and disease. Scientists have shown that land management practices to increase floral resources and improve semi-natural habitats, such as agri-environment schemes, can benefit these important insects, wildflowers and food production.

What pollinators need

Insect pollinators improve or stabilise the yield and quality of 3/4 of crop species worldwide, and are important for biodiversity and helping to maintain the populations of wild plants that provide shelter and food for animals. But they need a range of different resources throughout their lifecycle.

- 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; and, while some species are active from March to October, others only forage for a few weeks. A diverse bee community therefore requires a continuous succession of flowers to maintain food supplies.
- The offspring of some pollinators depend on leaves and insect prey, rather than flowers e.g. 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, e.g. from field margins and hedgerows, are required to sustain the food supply for pollinators. The mining bee *Andrena dorsata* is a key pollinator of apples blooming in spring, for instance, but its second summer generation needs later-flowering plants to survive.
- Pollinators need suitable places to nest, mate and hibernate over winter, whether underground, as solitary mining bees and bumblebees prefer, in dense tussock vegetation, which carder bumblebees need, or in cavities, where mason and leafcutter bees can dwell. Some pollinating flies require damp and wet areas or animal dung during their larval stages.

How much habitat is enough?

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

- nests of most common bumblebee species occur at a minimum density of 10-35 nests per 100ha; 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 2ha and up to 1km of flowering hedgerow in every 100ha of farmland can supply enough pollen for populations of 6 common wild bee species
- food resources need to be available within foraging distance of the nest, usually around 100m-1,000m, but this may range from 10s of metres for small solitary species to several kilometres for bumblebees and honeybees; to achieve this across an agricultural landscape, flower patches should be at least 0.25ha in size and no further than 250m 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 that they can devote more energy to raising healthy queens who will survive the winter.

Working together

Pollinators operate at scales larger than individual farms, so management needs to be coordinated by farmers and other land managers, who should work together to target the

needs of conservation-priority species. There are several simple steps that can help.

- Enhancing food resources for pollinators can increase their numbers and diversity at the landscape scale and locally. This could involve sowing or maintaining floral resources both in fields and along boundaries, including early-flowering trees and flowers such as willows and dead nettles. Most of these are commercially unavailable as seed, but can provide vital pollen and nectar for queen bumblebees and other early-flying pollinators.
- Flower mixtures are most effective if sown in landscapes where existing floral resources are scarce, although they are likely to benefit all landscapes.
- Sown flower patches or strips along lower-yielding field edges can increase both pollinator numbers and crop yields, as has been demonstrated with important crops such as field beans and field-grown blueberry. However, such yield improvements can take a few years to develop as the enhanced pollinator community becomes established.
- A mixture of habitats such as grassland, hedgerow, woodland and scrub in the landscape surrounding farms to provide both food and nesting resources often increases wild pollinator diversity and crop pollination services.
- Providing a diversity of nesting resources ? short turf, bare ground, plant stems, logs or 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, such as section 41 species in England, are targeted where these species occur through the new agri-environment schemes, with detailed guidance on the best management approaches to meet their specific habitat requirements.

Positive steps

Agri-environment schemes are a key means of supporting pollinators, and scientists have urged the government to promote greater uptake of these. In England, the new [Countryside Stewardship scheme](#) targets wild pollinators through the Wild Pollinator and Farm Wildlife Package. Applications containing management options from the package score highly and are more likely to proceed to an agreement.

More systematic monitoring of uptake, quality and provision of agri-environment schemes and voluntary initiatives on farms across the country would also be helpful and enable policy-makers to adjust their options on the basis of new evidence. Simple metrics for habitat quality could offer a rapid assessment tool for land managers, while systematic UK-wide monitoring using standardised methods would help to track changes in the status of pollinators and pollination services.

A range of habitats is important, and land managers can help by ensuring wherever possible that management of priority and semi-natural habitats accounts for the lifecycle needs of wild pollinators, for example by varying grassland sward height or managing scrub habitat sympathetically

Land managers can take many positive steps to promote healthy pollinator populations. Joint applications from farms for agri-environment or other financial support to manage entire landscapes for pollinators ? such as that provided by the new Countryside Stewardship Facilitation Fund ? are particularly important and can offer major benefits. Land managers should also be aware of options in the mandatory greening measures of the [Common Agricultural Policy](#) , such as Ecological Focus Areas, which can provide flower-rich habitats including grassland or scrub.

Providing resources throughout the course of the season is essential. For instance, by sowing a mixture of summer-flowering legumes, diverse mixes of perennial wildflowers, managed hedgerows cut on a 3-year rotation and trees including willow, you can provide important spring forage. Leaving verges or ivy uncut also provides late summer flowers.

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Options and opportunities

Training opportunities are available for farmers on establishing and managing pollinator habitats, for example via the Campaign for the Farmed Environment.

A new practical guide for conserving insect pollinators was also published in April, entitled [Habitat Creation and Management for Pollinators](#). This represents a 20-year research partnership between Marek Nowakowski, a practitioner with a passion for wildlife conservation on farmland, and applied ecologists working for the Natural Environment Research Council's Centre for Ecology & Hydrology, led by Prof. Richard Pywell. It provides farmers and other land managers with advice on creating and managing habitats for bees on farmland.

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Further information

- More information about the Insect Pollinators Initiative and all the Living with Environmental Change policy and practice notes from the research programme are available at www.insectpollinatorsinitiative.net.
- Images ? Claire Carvell
- Related competencies include: [Management of the natural environment and landscape](#)

This feature was taken from the RICS *Land journal* (July/August 2016)