

## Management for bumblebees – how farmers can bring back the buzz

### SUMMARY

- **Bumblebees are a crucial insect group for pollination of vegetables, fruit, oilseeds, legumes and fodder crops. Maintaining healthy bumblebee populations means that bees and other pollinators can quickly respond to the presence of mass flowering crops – an ‘on call’ service.**
- **In the UK there have been major declines in many social bumblebee species over the past 70 years, and two national extinctions. Over a third of social bumblebees are UK Biodiversity Action Plan priority species.**
- **Farmers can play a key role in reversing this loss through management of flower-rich areas to provide nectar and pollen sources and bumblebee nest habitats. A habitat network providing continuity and diversity of flowers is required from April to September.**
- **Bumblebees respond very quickly to improvement in food sources. Pollen sources are particularly important.**
- **Helping bumblebees will help a wide range of other invertebrates including honeybees, solitary bees, butterflies and other beneficial insects such as hoverflies, ladybirds and ground beetles.**
- **Integrating profitable farming and bumblebee conservation will improve the public perception of farming.**

### Introduction

In the UK there are 24 species of bumblebee representing ~10% of the world's bumblebee species.

In Scotland there are currently 19 species. There have been declines in both numbers of species and total bumblebee numbers. The decline is mainly due to the loss of flower-rich habitats as bumblebees exclusively depend on pollen and nectar as food sources. In addition traditionally managed hay fields and clover leys which were once common are now a much rarer sight.

This technical note explains the importance of bumblebees, their requirements and how farmers can help bring back the bumblebee.



*Great yellow bumblebee on common knapweed*

# The importance of Bumblebees

Bumblebees are ‘keystone pollinators’. Along with honeybees they are essential to farmers as they pollinate crops, fruits and wild flowers.

In the UK latest figures (2010) indicate that insect pollination contributes £440 million to farm income, or about £1 in every £7. Nearly all of this is provided by bees. Estimates of the contribution of wild bees, especially bumblebees, range from 50% to 90%, with managed honeybees and commercial bumblebees providing the remainder. The key message is that we need healthy populations of all our wild and managed bees and other pollinators. Wild pollinators are important in their own right as well as providing valuable ‘insurance’ against problems with managed bees.

In addition to bumblebees there are solitary bees (80 species in Scotland) that can also be important pollinators and, although they tend to have short flight seasons, many different species are found from March to September.



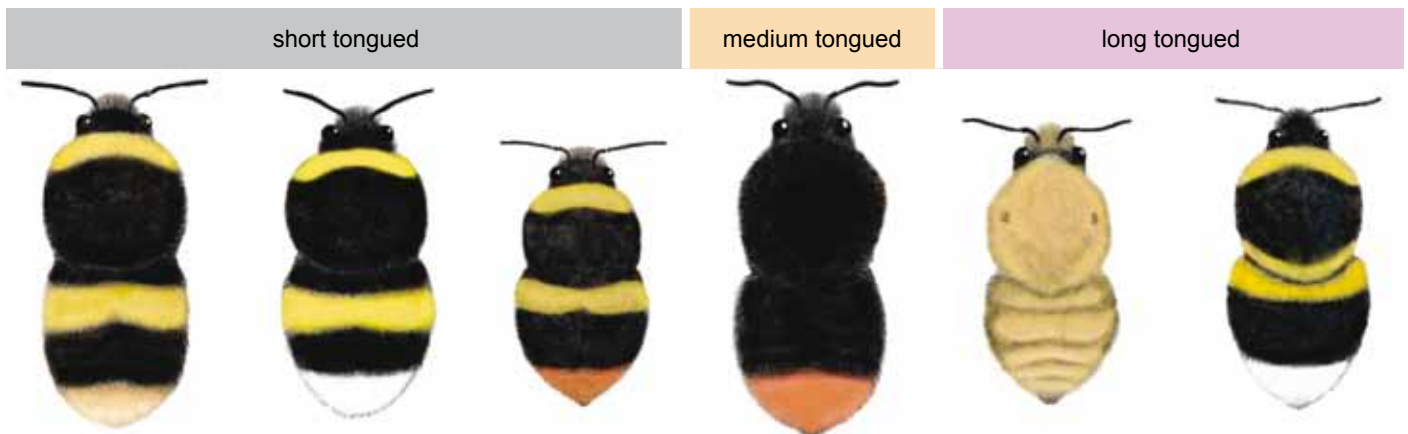
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Red tailed bumblebee

## Bumblebee species

The common bumblebee species tend to be more important for pollination of crops and wildflowers by virtue of their abundance. They represent a guild of short, medium and long-tongued bumblebees. Therefore, they help support very diverse habitats and between them pollinate a wide range of crops.

The six bumblebee species common in most of Scotland are in the table below. From left to right: buff-tailed, white-tailed, early, red-tailed, common carder and garden bumblebee.



“The Big Six” bumblebees (queens illustrated).

Short-tongued bumblebees are valuable pollinators of oilseed rape, while long-tongued species are better for legumes and red clover. Soft fruits and top fruits are visited by all species, but particularly short-tongued. Commercial bumblebees are varieties of the buff-tailed bumblebee, of which the native, ‘buff-tailed’ form is now available (‘audax’).

Our rarest bumblebees tend to be long-tongued grassland species that emerge late in spring. For these, legumes are particularly important, especially red clover, with common knapweed heavily used later in the season.

The **great yellow** bumblebee *Bombus distinguendus* is now confined to Argyll (Coll & Tiree), the Western Isles, Highland (north coast of Sutherland and north east Caithness) and Orkney.

The **moss carder** bee *B. muscorum* is associated with uplands and flower-rich grasslands. The mainland form is very similar to the common carder bee. It is rare in southern Scotland and is also found in Orkney. Some islands of the Inner Hebrides, the Western Isles and Shetland support a distinctive form that can be particularly abundant on machair.

The **red-shanked carder** bee *B. ruderarius* is now resident only in Argyll (Coll and Tiree), though it has been recorded elsewhere in the past. It is similar to the red-tailed bumblebee. It is widespread but not common in England and Wales, mainly in the south.

Upland bumblebee species are heavily dependent on heathers and related species, including blaeberry. An abundance of these upland flowers close to species-rich grasslands or flower-rich woodlands is ideal for these species.

### Lifecycle

Bumblebees have a one year life cycle and live in colonies comprising a queen and up to 300 workers. Nests are founded in spring by a queen who mated the previous autumn and hibernated over winter. The queens can be seen as early as February, but most are seen from late March into May.

In spring the queen must first feed up on nectar and pollen to restore body condition after hibernation. Once a suitable nest site is found, pollen is collected and formed into a clump. Into this the first batch of eggs is laid (and incubated at 30°C) which become the first brood of workers. The queen also creates her own honey pot as an energy store.

Successive batches of workers are reared and take on foraging and nest maintenance duties, before males and daughter queens are reared in summer. At the end of the summer the whole colony dies apart from the new mated queens, which hibernate elsewhere.

Throughout the colony's life there is a need for continuous availability of suitable flowers from which pollen and nectar can be collected. A diversity of flowers helps provide this continuity and helps support different species. For example, white clover and raspberry are good for short-tongued bumblebees, and red clover and yellow rattle are good for long-tongued bumblebees. Bumblebees are active for longer in the season, work longer hours and forage in colder weather than honeybees.

Pollen is essential because of its protein content. Crucially, pollen is collected from a narrower range of flowers than nectar. These flowers are therefore particularly vital for bumblebees. In honeybees, pollen is also important, but abundant nectar sources are required to ensure harvestable quantities of honey.

It has been suggested that only one in five hibernating queens successfully establish a nest the following spring. Therefore each nest must, on average, rear at least five new daughter queens to keep numbers stable. Lack of flowers, compounded by bad weather conditions, can cause colonies to fail before this stage.

Bumblebees will often fly at least 1km from the nest to locate and forage from suitable flower-rich patches. Unlike honeybees, bumblebees have only small honey stores, which can quickly become exhausted if flowers are scarce and/or weather is very wet. A diversity of flower species ensures continuity from April to September, meeting demand at critical periods in spring and summer, and also supporting different bumblebee species.



*Moss carder bee on red clover*

## Requirements of Bumblebees

Bumblebees have three main requirements:

1. A supply of food (pollen and nectar) throughout the season from April through until September. Nectar is needed for energy but pollen is particularly vital as a source of protein for developing larvae.
2. A suitable nesting site. Different bumblebees have different requirements. Most species nest underground or in cavities (even in birdboxes). They often make use of an old mouse nest or vole

run. The exceptions are the carder bees that nest on the surface of the ground in tussocky grass (or even in the base of garden plants).

3. Suitable safe places for the queens to hibernate. This is usually underground. After mating, the daughter queens tend to dig into loose soil and establish a chamber within which they hibernate. Some species typically use woodlands. Other hibernation sites include banks or ditchesides, or within dead wood.

## What can farmers do for Bumblebees?

The best way to support bumblebees in a farming landscape is to have a number of flower-rich areas close to bumblebee nesting habitat. Together, these provide flowering continuity and diversity. Patches can be large, for example cut or lightly grazed species-rich grassland, or clover leys where flowers are available for bees. There are also 'edge' habitats such as grass margins, hedges, dykes and ditches, and seed mixes that contain suitable pollen and nectar sources.

To attract the "Big Six" bumblebee queens to nest on the farm there needs to be a combination of early pollen and nectar close enough to areas with possible nest sites. Two of the most important sources of food for queens in spring are the catkins of pussy (goat) willow (*Salix caprea*), and early flowers such as white deadnettle, both often present on farms. In addition, farm gardens themselves are often very useful.

The queens need to find a suitable nest site close to reliable early sources of pollen and nectar. Grass margins, ditches, dykes, hedgerows and woodland edge provide habitats for small mammals and therefore bumblebees, though gardens tend to have the highest densities of bumblebee nests.

Once queens have established a nest there is often a 'lull' in bee activity in late spring while most queens are incubating. It takes four weeks for the first workers to emerge from the nest and from then the colony builds up slowly. Summer is the period of peak demand, linked to the rearing of new daughter queens.



*Common carder bee on crimson clover*

### Early season flowers

Pussy (goat) willow  
Wild cherry  
White deadnettle  
Blaeberry  
Bird's-foot trefoil  
Red campion  
Bugle

### Mid-season and peak season flowers

White and red clover  
Bush, kidney and tufted vetches  
Meadow vetchling  
Yellow rattle  
Foxglove  
Raspberry and bramble  
Heathers and heaths  
Common knapweed  
Devil's-bit scabious

### Management of Species Rich Grasslands –

The best option for bumblebees is the management of existing and created species rich grasslands as these are permanent swards for long term benefit. See Management of Species Rich Grassland. SAC Technical Note TN629.

For maximum benefit to bumblebees, it is recommended to manage species rich grasslands so that flowers are still available for foraging bees until the end of August. This also means that many flowers that have finished flowering can successfully set seed and regenerate.

Most new queen larvae will have been fed sufficient pollen by early or mid August. However, nectar is still required for workers to maintain conditions to ensure that these new queens develop successfully and 'fledge'. Also, late pollen sources may help feed the critical few percent of new queens needed to maintain populations.

For management of the great yellow bumblebee (SAF, UKBAP), moss carder bee (UKBAP) and red-shanked carder bee (UKBAP) it is recommended that the grazing plan includes a commitment to remove or reduce stock from the site in late spring and summer. This will allow flowering and seeding of useful species. Cattle are the most suitable for summer grazing as sheep will selectively graze flower heads.

### Creation of Species Rich Grasslands

A suggested seed mix is given below for those wishing to benefit the great yellow bumblebee and other UKBAP bumblebee species in Scotland). Variations on this mix could be used. Flowers that benefit the great yellow bumblebee are marked \* in the table above.

Species poor, unimproved grasslands should first be managed to allow flowering to encourage natural regeneration. Thereafter, if necessary, these can be enhanced by scarifying and over sowing with wildflower species or plug planting wildflowers into the sward.

Flowers	
Red Clover*	2%
Meadow buttercup	2%
Common Knapweed*	1.55%
Ribwort plantain	1.50%
Tufted Vetch*	1.50%
White Clover*	1%
Self Heal*	2%
Bird's foot trefoil*	1%
Yarrow	1%
Lady's bedstraw	0.70%
Yellow rattle*	0.50%
Common sorrel	0.20%
Meadow vetchling*	0.05%

Grasses	
Festuca rubra ssp rubra (Strong creeping red fescue)	35%
Poa pratensis (Smooth stalked meadow grass)	31%
Cynosurus cristatus (Crested Dog's tail)	15%
Alopecurus pratensis (Meadow foxtail)	4%

### Hedges, Trees & Shrubs

Plant pussy willow and wild cherry to mature in gaps in hedges, along water margins, along woodland edges or in clearings. Hawthorn, blackthorn and dog rose blossom is also useful.

Encourage suitable wildflowers in grass margins, hedge bottoms, water margins, among scrub and in wooded areas.

### Grass Margin Management & Creation

The best management is to have a combination of differently managed margins. Leave some areas of rough grass to develop a tussocky structure that will attract mice and voles, the nests of which can be used the following year. High nest densities are found along hedges, fence lines (grass margins) and woodland edges. However, other nests, albeit at lower densities are also found in open, rough grassland fields.

Other unimproved or semi-improved margins should be managed by cutting (with removal of cuttings) and/or grazing in late summer to encourage natural regeneration of wildflowers.

If creating new grass margins a long-term grass margin mix enhanced for bumblebees would include red clover, common knapweed and tufted vetch as well as a diversity of other species to support bees and other beneficial insects. In general after sowing the margin will benefit from a cut in late spring. Thereafter manage as above by cutting (with removal of cuttings) and /or grazing.

Cuttings have to be removed as wildflowers are outcompeted by competitive grasses.

Frequently rotated grass margins can be enhanced to provide short-term boosts for bumblebees by including short-lived agricultural legumes such as red clover. However, where wildflower-rich margins can be encouraged, these provide the greatest long-term benefits.

### Enhance Unharvested Crops/Wild bird seed mix

Grant aided wild bird seed mix/unharvested crop require either a mix of annual crops, including at least one cereal and the addition of kale for a two year option. Some components are used by bumblebees, such as fodder radish and sunflower.

However, these crops can be specifically enhanced for bees and other insects by including a small proportion of pollen and nectar sources. Commonly, phacelia (an annual) is used and in two year mixes, red clover. Borage is also very good for honeybees and short-tongued bumblebees. Sweet blossom clover, sainfoin and crimson clover have also been used.



*White tailed bumblebee on unharvested crop enhanced with phacelia.*

### Pollen & Nectar mix

A 'bumblebee mix' based on agricultural cultivars can be used. Most mixes are designed to help rare bumblebees, and as these tend to be long-tongued, red clover is the main component. Including other legumes supports a wider range of bees and other insects, sometimes in very large numbers. Both autumn-sown and spring-sown mixes have been used successfully.

These provide a valuable short-term boost of pollen and nectar, and are usually resown after three years. Ideally, the mixes are cut after flowering and cuttings removed as silage or finely mulched and spread. Light grazing can also be used. As yet the nectar mixes are not grant aided but may be considered as short-term grass margins.

## Grants, Rules and Regulations

Agri-environment grant schemes provide payments for a variety of habitats that may be beneficial to bumblebees. These include species rich grassland, wetlands and hedge creation and management. Management of habitat mosaics and or scrub/tall herb communities can also provide excellent bumblebee habitat.

Most of these options require a Specialist Grazing Plan. There are also payments for scrub control, hedgerow management and fencing.

## Further Information

Further information on bumblebees can be obtained from the following organisations web sites:

Scottish Agricultural College (SAC) <http://www.sac.ac.uk/>

Bumblebee Conservation Trust (BBCT)  
<http://www.bumblebeeconservation.org.uk/>

Scottish Natural Heritage (SNH)  
<http://www.snh.gov.uk/>

Scottish Government (SGRPID for agri-environment grants)  
<http://www.scotland.gov.uk/Home>

## References

*Bumblebees on the Edge. A guide to habitat management for bumblebees in north and west Scotland*, RSPB and Bumblebee Conservation Trust.  
*SAC Technical Note TN629 – Management of Species-rich Grassland*, Christine Hall

*Farming for Wildlife – Pollen & Nectar Mixes*, RSPB / The Game Conservancy Trust.

*The Big Six – Common bumblebees Found in Gardens*, Bumblebee Conservation Trust

*Rarer bumblebees of Scotland*, Bumblebee Conservation Trust

*Information Pack for Farmers. Managing and maintaining pollen and nectar mixes for bumblebees*, Hymettus, Natural England and Operation Bumblebee

*Bumblebees – bringing back the farmland buzz*, Centre for Ecology and Hydrology

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