Plants for Bugs: all in the mix

It is hard to overstate the significance of the Plants for Bugs project, a study by RHS Science that has quantified the benefit of non-native garden plants to wildlife

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See also News p8

Studies in recent decades have shown that many gardens are rich habitats for wildlife. Plants are a key factor in this, but it is unclear how the value to wildlife of native and non-native garden plants compare. Guidance for gardeners wishing to plant to encourage wildlife can be confusing. Views differ on whether only native plants should furnish a wildlife-friendly garden, or whether non-native species and cultivars also have a place.

An average UK garden, excluding the lawn, contains around 70 percent non-native and 30 percent UK native plants. With this strong emphasis on non-native cultivated (ornamental) plants, gardens are clearly unlike more natural habitats, such as native woodland or nature reserves. Gardens typically also have greater plant-species diversity than these habitats, farmland or areas managed for forestry.

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Plots created for the project

The Plants for Bugs project consisted of 36 plots (each 3 x 3m/10 x 10ft; the size of a typical garden border) on two sites: one within RHS Garden Wisley, the other at the adjacent Deers Farm research field, both in Surrey. Planting was divided into three categories: one native and two non-native. Each plot was planted with a mix of 14 plant species native to one of three geographical zones: the UK ('native'); the northern hemisphere excluding the UK ('near-native'); and the southern hemisphere ('exotic').

Each bed included bulbs, perennials, shrubs, a climber, grasses or ferns and was designed to appear as similar as possible in terms of plant height, density and position in the plots (outlined right). Sampling was undertaken for four consecutive years (2010–13).

Origins of the study

The Wildlife Gardening Forum is a collection of organisations and individuals – including representatives from the RHS – who are interested in the wildlife in our gardens, and how important gardens are for wildlife as well as human health and wellbeing. In 2007, the Research Working Group of the forum suggested a major scientific study was needed to fill the gap in knowledge around the role that garden plants (native and non-native) play in supporting wildlife.

RHS/CAROL SHEPPARD

With acknowledgment of gardens as a valuable habitat, not least in an increasingly urbanised world, the RHS recognised it was in gardeners' interests to take on the research challenge; in 2010, Plants for Bugs was born at RHS Garden Wisley, Surrey.

This pioneering study is the first field experiment (in a garden setting) designed to test whether the geographical origin ('nativeness') of garden plants affects the abundance and diversity of the invertebrates (insects and other animals without a backbone) that they support. »

THE GARDEN COLLECTION / FLORA PRESS / TIM GAINEY

'...diversity of plant origin in gardens is a strength, not a weakness, in supporting pollinating insects.'

Planting for pollinators: three key messages

1 **Plant a mix of flowering plants from different countries and regions.** This is the best strategy for gardeners wanting to support pollinating insects in gardens (see box, p44).

2 **Place an emphasis on plants native to the UK and the northern hemisphere**, as more pollinators from a range of pollinator groups visited these. However, plants from the southern hemisphere – such as *Lobelia tupa* and *Verbena bonariensis* – can also be valuable: some provide nectar and pollen for specific pollinators, and by tending to flower later than native and northern-hemisphere plants, southern-hemisphere species extend the flowering season, to provide nectar and pollen long after other plants have gone to seed.

3 **The more flowers a garden can offer throughout the year** – regardless of plant origin (native or non-native) – the greater number of bees, hoverflies and other pollinating insects it will attract and support.

Invertebrates are the basis of a garden's animal biodiversity. After four years of data collection and a year of analysis, the first results of the experiment focusing on pollinating insects have just been published in a peer-reviewed scientific journal (see News, p8).

Guiding gardeners

The main finding was that there was no significant difference between the numbers of pollinators visiting the native and the northern hemisphere ('near-native') plots. This comprehensively dispels the myth that a garden full of native plants is crucial to the success of a 'wildlife garden' as a habitat for pollinators. In fact, non-native plants can be just as valuable to wildlife as natives – and we now have the data to prove it.

Common names of plants such as honeywort (*Cerinthe major*, from southern Europe) and beebalm (*Monarda didyma*, from North America) play testament to recognised plant-insect relationships. The Plants for Bugs pollinator research is the first time anywhere in the world that quantifiable data has been available to prove that diversity of plant origin in gardens is a strength – not a weakness – in supporting pollinating insects.

Findings for other invertebrate groups (herbivores, predators, decomposers and more) studied will be published in further papers. The soil fauna and function in the study plots was also assessed as part of a PhD project, in association with the University of Roehampton, London.

The findings of the first Plants for Bugs paper are, of course, directly relevant to gardeners, but the implications are potentially more far-reaching, as they can be applied to other forms of green space that are managed in a garden-like way.

Any organisation involved in ornamental plantings – including local authorities, which have a responsibility for parks, and the landscape sector – could benefit from the core message of the study: that the value of a site can be maximised for pollinators by choosing plants from different regions of the world.

WHAT GARDENERS CAN DO TO HELP POLLINATORS

RHS / PAUL GIBBONS

***Verbena bonariensis* with hoverfly.**

RHS / CAROL SHEPPARD

***Crocus* attracts an early bumblebee.**

RHS / ANDREW HALSTEAD

Red admiral butterfly on late-flowering ivy (*Hedera*).

Plant for a long season

Providing nectar and pollen for as long a season as possible is key to encouraging pollinators.

Sometimes we forget show gardens or borders full of flowers pictured in magazines are merely snapshots of a garden, a moment in time. Plant flowering season and duration varies: some offer a quick burst of colour (certain ornamental alliums, for example). Others give a long succession of flowers, for example *Cosmos*, *Digitalis*, *Erysimum*, *Eschscholzia* and *Phacelia tanacetifolia*.

Creating floral displays through much of the year is already a goal of many gardeners, but is also worth striving for to feed pollinators that visit your plot. If your garden goes 'quiet' on the floral front, a visit to a garden centre will reveal what is in season – plants bearing the RHS Perfect for Pollinators bee logo are particularly useful (to download the *RHS Perfect for Pollinators Garden Plants* list, arranged by season, see box, p44).

Early and late sources of nectar and pollen such as crucus, winter-flowering honeysuckles, winter box, dahlias, *Elaeagnus* and ivy are particularly valuable to early and late-season pollinators.

RHS / MARK BOLTON

The more flowers the better, as far as pollinators are concerned.

Pack them in

Unsurprisingly, the more flowers you plant, the more pollinators your garden is likely to attract.

It may seem obvious, but the study found pollinator abundance increased with flower abundance (more flowers means more pollinators), regardless of plant origin. So, if in doubt, plant for more flowers and pack them in. Even the tiniest plot can find space for a windowbox of purple heliotrope and snapdragons, or a few tubs of single red *Dahlia* 'Bishop of Llandaff'.

A sunny spot ensures maximum flowering and greatest draw for insects. *Centaurea*, hardy geranium, lavender and salvia make attractive border plants, but don't forget flowering shrubs and climbers – these offer height and structure, so squeeze in a hebe, single-flowered rose, *Olearia* (daisy bush), *Clematis cirrhosa* or *Campsis* if you can. If space is too tight for large plants, dot slender *Verbena bonariensis* or *Linaria purpurea* between existing plantings. Deep shade is a challenge for most flowering plants, but part shade suits *Phuopsis stylosa*, *Hydrangea paniculata* and evergreen *Bergenia*.

Lastly, consider trees: these are often overlooked for their flowering potential, but insects are drawn to pollen-rich willows and nectar-rich maples (*Acer*) and most limes (*Tilia*).

Plant a mixture

Maximise the diversity of pollinating insects that your garden supports by including as wide a range of flower types, shapes and sizes as possible.

It used to be thought planting natives alone was essential for wildlife; the Plants for Bugs research, for pollinators at least, suggests this may not be the best approach in gardens. Instead, growing a mixture of plants from different regions is key. This does not mean that a wildflower meadow, Mediterranean-themed border or an exotic 'South African' bed has no place in a pollinator-friendly garden. But gardens themed on plants from one region are unlikely to support the highest number of pollinators.

Place an emphasis in your plot on plants (and their cultivars) from the UK – such as purple loosestrife, hemp agrimony and hawthorn – and the northern hemisphere – including Japanese quince, common marigold and weigela. Try extending the season with some later-flowering plants from the southern hemisphere – such as fuchsia, tobacco plant and nasturtium – that can flower right up to the frosts. To help get a good mix, consult the new selection list *RHS Perfect for Pollinators Plants of the World* (see box, p44).

RHS / OLIVER KITE

Late-season border with southern-hemisphere plants including *Crocosmia*.

RHS / CAROL SHEPPARD

Thick-legged flower beetle on *Geranium*.

RHS / CAROL SHEPPARD

Cuckoo bumblebees on *Cephalaria*.

Observe and record

Your own garden's particular characteristics – and where it is located in the UK – will play major roles in which pollinators it can attract. Local knowledge can be vital.

Pollinator-friendly plant lists offer a solid starting point, highlighting plants that work, but they are not infallible. If there is one message to take from pollinators in this RHS study, it is that plant diversity rules, so never be afraid to increase your planting palette. Observe plants in your garden, and gardens in your neighbourhood, to see which plants attract the most insects – a plant visited by hoverflies in a coastal Scottish garden may attract more hoverflies, fewer hoverflies, no hoverflies or completely different species such as solitary wasps when grown in a London garden.

Glean invaluable local knowledge by trying a wide range of plants and observing them over the year. Field guides can help with insect identification, or simply notice which flowers are buzzing loudest or drawing the most insects. Keep notes, and add more top performers to your garden when you can.

RHS / CAROL SHEPPARD

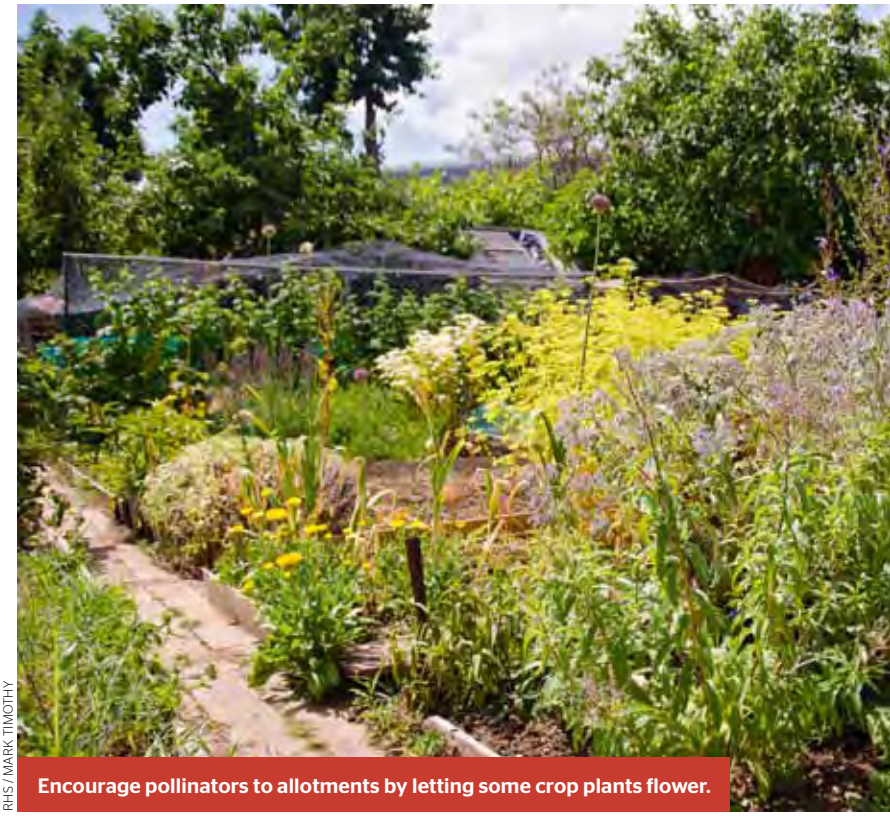
On allotments, too

It is not just ornamental gardens that can support a wide range of pollinators; allotments may play their part.

The Plants for Bugs research does not stand in isolation. There are many research projects, reports and peer-reviewed papers (as many as eight or nine new ones a day) helping to inform our understanding of pollinator needs. One such project, the Urban Pollinators Project, has demonstrated that gardens and allotments are real 'pollinator hotspots' among other urban green spaces.

Allotment holders can make a huge contribution to pollinator conservation simply by allowing a small proportion of herbs and vegetables on their plots to flower. Crops such as tomatoes, beans and courgettes rely on pollinators to set fruit, while rocket, mizuna, lettuce, pak choi, parsnip, leek, onion and cabbage will all attract beneficial insects if a few are left to 'bolt' (flower and set seed).

Flowers for cutting – such as annual cornflower, Canterbury bells, larkspur, love-in-a-mist and zinnia – also add pollen and nectar value. Weeks of picking for the vase equates to plentiful nectar and pollen for bees and other insect visitors. Urban beekeepers, whose honeybees rely on foraging in greenspaces such as gardens, parks and allotments, will also benefit.



RHS / MARK TIMOTHY

Encourage pollinators to allotments by letting some crop plants flower.

Carrying out the research

RHS / PAUL DEBOIS

Senior Horticultural Advisor **Helen Bostock** (left) and RHS Principal Entomologist **Andrew Salisbury** (right) on the study.

The RHS Plants for Bugs study was designed to remove bias and was developed along rigorous scientific lines as a controlled experiment. Two sites were chosen at RHS Garden Wisley, each with 18 3 x 3m (10 x 10ft) timber-edged plots, separated by 1m (39in) wide woodchip paths.

✣ **Layout and management of the plots.** The plots were laid out in blocks of three beds; one planted with UK native plants, one with northern-hemisphere plants (excluding the UK), and one with southern-hemisphere plants. The identically designed beds each contained 14 species of plants which corresponded within each block. For example: *Stachys officinalis* in the native bed; *Stachys byzantina* in the northern-hemisphere bed; and *Lobelia tupa* in the southern-hemisphere bed. In addition, planting was chosen from three species groups (identified as A, B and C), resulting in nine variations on the planting scheme. Thus, the set of 14 species of plants in native bed A would not have been identical to the set of 14 plants in native bed B, and so on. Plots were hand weeded, watered, and plants cut back or staked as required. No pesticides were used on the plots.

✣ **Data recording.** Tens of thousands of invertebrates were recorded, including eight species of bumblebee; more than 50 species of spider; and more than 40 species of ground beetle. Four sampling methods were used: from the ground, using pitfall and slug and snail traps; from the foliage using a Vortis suction sampler (pictured, above right); and from the flowers by visual observation at around six-week intervals. When weather conditions were favourable for flying insects, each side of each plot was observed for one minute (am and pm) noting any insect landing on the flowers. The number of flowers open was also estimated to aid the statistical analysis.

In 2010 more than 2,300 pollinating insects were observed; in 2011 the number was more than 2,600; in 2012, more than 2,000; and in 2013 more than 1,400 pollinators were recorded. Groups of insects with good numbers of individuals (such as bumblebees, honeybees and hoverflies) were included in the analysis.

Andrew Salisbury using a suction sampler to collect invertebrates.

RHS / GEORGI MABEE

FURTHER INFORMATION

✣ **For more information on the project**, including a full plant list, an interpretation bulletin and links to the full scientific paper, visit: **www.rhs.org.uk/plants4bugs**

✣ **Download** *RHS Perfect for Pollinators Plants of the World* and other plants lists at: **www.rhs.org.uk/perfectforpollinators**

✣ **For more on the Wildlife Gardening Forum** visit: **www.wlgf.org**