

# RHS Plants for Bugs



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**Bulletin 2 – August 2017**

Gardens as habitats for plant-dwelling invertebrates

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# RHS Plants for Bugs

Supported by the Wildlife Gardening Forum

It's often assumed that insects and other invertebrates that live in gardens are best supported by native plants, but is this true? Our research has shed new light on the plantings UK invertebrates prefer.

## Summary

- ◆ Garden plants can support a wide range of plant-dwelling invertebrates.
- ◆ The more densely you plant, the more invertebrates your garden will support.
- ◆ Native planting schemes will support the most plant-dwelling invertebrates.

## Recommendation

To support invertebrate abundance in gardens and other cultivated green spaces, choose plantings biased towards UK native and near-native plants and encourage dense vegetation. Near-native and exotic plants should not be dismissed, however, since these will still provide a habitat for invertebrates, and will support pollinators when in flower.

Left. Caterpillar of knotgrass moth (*Acronicta rumicis*).

## Background

Conducted over four years by RHS Science at RHS Garden Wisley, Surrey, and supported and inspired by the Wildlife Gardening Forum, Plants for Bugs was a unique field experiment, designed to test whether the geographical origin of garden plants affects the abundance and diversity of invertebrate wildlife they support.

## Experimental design and set up

The project consisted of 36 plots (each 3 x 3m, the size of a typical garden border; see plan, right) on two sites, one within RHS Garden Wisley and the other at the adjacent Deers Farm research field. Each plot was planted with a mixture (assemblage) of 14 plant species native to one of three geographical zones (treatments):

- ◆ UK (native);
- ◆ northern hemisphere excluding the UK (non-native – northern; referred to below as “near-native”);
- ◆ southern hemisphere (non-native – southern; referred to as “exotic”).

Each plant assemblage included bulbs, perennials, shrubs, a climber, and grasses and / or ferns, and was designed

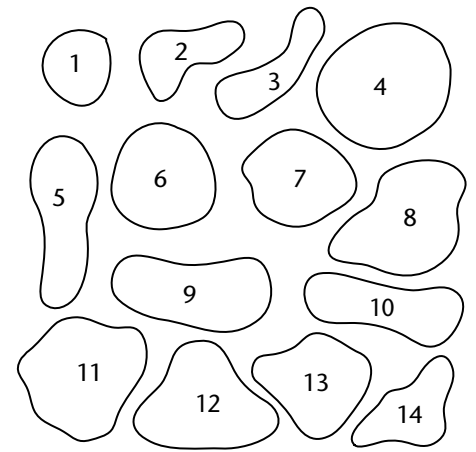
to appear as similar as possible in terms of plant height, density and position in the plots. The plots were managed as typical garden borders and so were hand-weeded, watered, and cut back or staked where required. No pesticides were used on the plots. The study was scientifically designed to remove bias, and all protocols were developed along rigorous scientific lines.

## Sampling

Tens of thousands of invertebrates were recorded from all plots by several methods: from the ground using pitfall and gastropod (slug and snail) traps; from the foliage using a Vortis suction sampler (below right); and from the flowers (pollinators) by visual observation. Sampling finished at the end of 2013.

## Publication

The research is being published in peer-reviewed scientific journals (see references, p.8), so will have been independently reviewed to ensure impartiality and accuracy. Each paper will also be summarised in a bulletin, to provide the help gardeners need when choosing a wildlife-friendly mix of garden plants.



Above. The Plants for Bugs plot planting plan. Each plot contained 14 plant species belonging to one of three treatments: UK native, near-native and exotic.

Inset. A species of wingless braconid wasp, *Heterospilus hemipterus*, was recorded for the first time in Britain on the plots. The host of this bizarre parasitoid remains unknown (see references, p.8).



Below right. Nearly 23,000 invertebrates were collected directly from the plants by Vortis suction sampler. Each plot was swept with the suction sampler on five or six occasions each year, with every plant species on a plot being sampled. Samples were sorted and identified in the laboratory.

Below left. View of the Plants for Bugs plots at Deers Farm, Wisley.



# What the research tells us

This bulletin is about the invertebrates living on our garden plants. It includes those that eat living or decomposing plant material, and those that feed on other invertebrates. It doesn't include pollinators – see Bulletin 1 for these.

## The importance of plant-dwelling invertebrates

As in all land-based ecosystems, plants are the basis of a garden's food chain. Some invertebrates feed on leaves and stems, either when these are in their 'green' state (caterpillars and aphids, for instance) or when they decay and play host to algae and fungi (for example, springtails). These invertebrates are then prey for other species such as spiders and parasitoid wasps (see predators, p.6).

Although some of these invertebrates are traditionally regarded as pests by gardeners, they support populations of natural predators, which in turn help maintain a balanced ecosystem. They break down dead plant material and recycle nutrients. They also provide food for garden birds and mammals such as hedgehogs. In short, an abundance of invertebrates of all types equates to a healthy garden ecology.



## Key findings

Our research shows that garden plants can support a wide range of invertebrates. These findings can be summarised as follows:

- ◆ The best strategy for gardeners wanting to support plant-dwelling invertebrates in gardens is to **plant a predominance of plants native to the UK.**
- ◆ Planting schemes based on **near-native plants may support only marginally fewer invertebrates** than UK native schemes. This applies both overall (less than 10% fewer) and in three of the four primary invertebrate functional groups investigated (herbivores, predators and detritivores).
- ◆ Planting schemes based on **exotic plants will still support a good number of invertebrates**, albeit around 20% fewer than UK natives.
- ◆ Regardless of plant origin, **the more densely a planting scheme is planted or allowed to grow, the more invertebrates** of all kinds (herbivores, predators, detritivores and omnivores) it will support.



Above. **Small copper butterfly (*Lycaena phlaeas*) on *Verbena bonariensis*.**

We would emphasise that this interpretation is only intended for those choosing plants for an ornamental garden in the UK (home gardeners, professional horticulturists, community gardeners, garden designers and landscapers working in a garden setting). Outside the artificially managed garden, for example in managing semi-natural habitats where the conservation of native habitat and species are the primary concern, different criteria apply.

**“Regardless of plant origin, the more densely a planting scheme is planted or allowed to grow, the more invertebrates it will support.”**

## Plants for Bugs – Bulletin 1

Previously we have reported on pollinating insects ([Bulletin 1](#)). In summary, it was found that the best strategy for gardeners wanting to support pollinating insects was to pack gardens with a range of flowering plants from different regions. While emphasis should be given to UK native and near-native (other northern hemisphere) plants, exotic plants from the southern hemisphere have value as they extend the flowering season.

## How to apply this in the garden

For gardeners wanting to encourage an abundance of plant-dwelling invertebrates as part of a healthy garden ecosystem, here are some recommendations:

**1** Think closer to home – plant plenty of UK native plants to support maximum numbers of herbivores, predators, detritivores and omnivores (see overleaf for more on these groups).

**2** Decide priorities – planting a greater proportion of exotic (southern hemisphere) plants may support marginally fewer herbivores but will help extend the season for certain pollinators (see Bulletin 1).

**3** Let it fill out – whatever you decide to plant, allow plants to fill the space to maximise foliage density and cover.

**4** Plant generously – to obtain the same number of invertebrates as from a plot of UK native plants, you would need about a fifth more near-native (northern hemisphere, excluding UK) vegetation, and about a quarter more exotic (southern hemisphere) vegetation (see p.8).

**5** Be relaxed – tolerate some nibbled leaves, don't spray at the first sign of damage and allow some plant debris to accumulate if you want to support your garden's food chain.

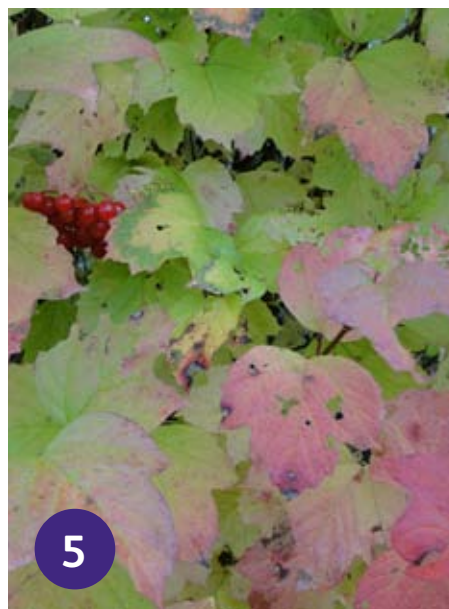
Remember, the good news is that any planting is better than none, and garden plants originating from all regions in our experiment supported a good number of plant-dwelling invertebrates.



3



4



5

# Just what do plants support?

Plants play a hugely important role in land-based ecosystems, especially in the garden. The four primary invertebrate groups in this system are herbivores, predators, detritivores and omnivores. Here we look at their function in our gardens, where to expect them among garden plants and examples from each group recorded on the Plants for Bugs plots.

## Herbivores (1 2)

These eat living plants. They can have chewing mouthparts (such as caterpillars and some beetles) or sucking mouthparts (such as thrips, aphids and some other true bugs). The group contains generalists which are able to feed on a wide range of plants and some very specialist feeders which only feed on a few plant species. They sometimes damage garden plants.



**1** Leaves with holes: caterpillars and some beetles

**2** Leaves with flecks and spots: aphids, thrips and some true bugs



**3** Damp areas and rotting plant material: woodlice

## Predators (6 7)

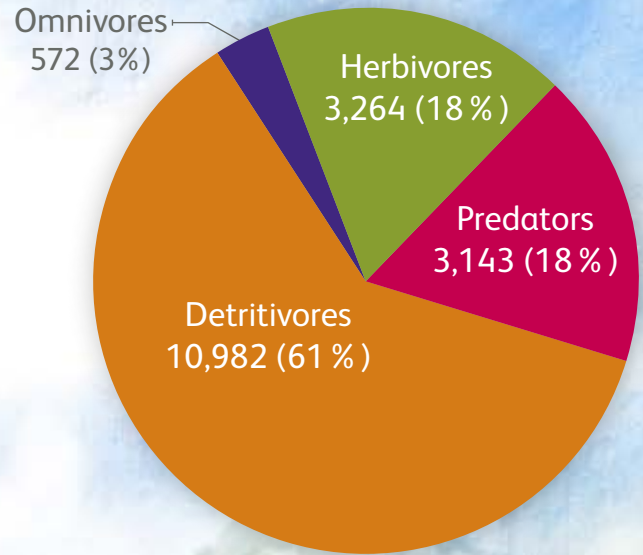
Predatory invertebrates eat other invertebrates. This group includes the predatory beetles (e.g. ladybirds), some true bugs, spiders and parasitoid wasps (parasitoids kill their host, while parasites usually do not). They are vital in any healthy ecosystem and help keep some problematic invertebrates in check, including many herbivores.



**6** Aphid-infested shoots: ladybirds

## Detritivores (3 4 5)

Detritivores feed on decomposing organic matter, of animal or plant origin. They are vital in recycling dead material in the garden. Many also feed on fungal and algal growths. This group includes springtails, woodlice and some beetles that feed exclusively on dead material.



## Vortis suction sampler catch over the four years of the project

excluding 4,741 unclassified (mostly non-feeding adults)

### 8 All plant parts, including seedheads: harvestmen



### 4 Algae and fungal growths on living plants in still and shady spots: springtails



### 7 Evergreen shrubs: web-spinning spiders



### 9 Plant stems and garden structures such as sheds: earwigs



## Omnivores (8 9)

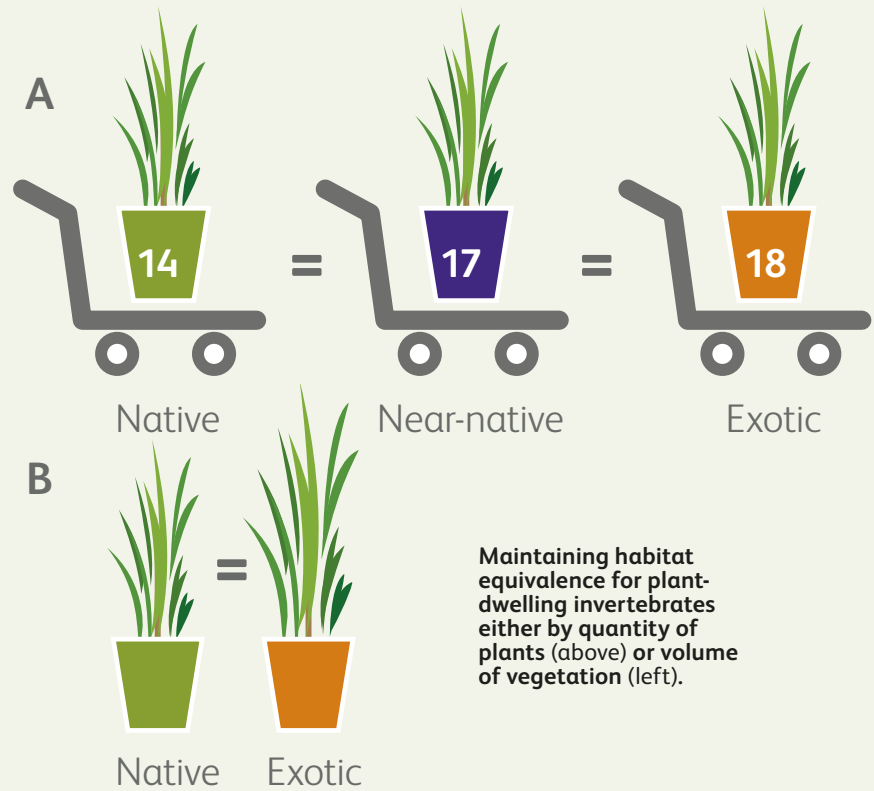
Omnivores feed both on plants and invertebrates. This broad feeding strategy makes them very adaptable if one food source becomes scarce. This group includes the harvestman (a relative of the spider) and the common earwig, which feeds on other invertebrates such as aphids, as well as the leaves of some plants.

### 5 Algae and fungal growths on fences: springtails



## Combining plant quantity and quality

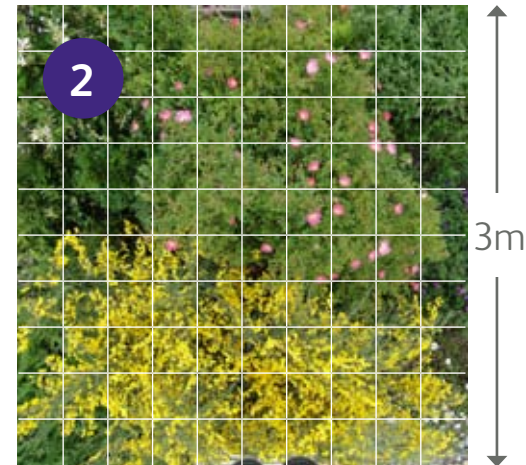
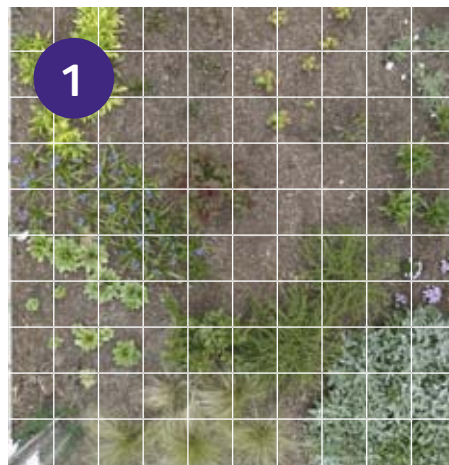
In a typical garden there is usually a mix of plants from different regions. But if you were to choose plants from a specific region (as we have done in this experiment), to obtain the same number of invertebrates as from a plot of UK native plants, you would need about a fifth more near-native vegetation, and about a quarter more exotic vegetation. There are two ways to achieve this: either by varying the number of plants (A) or by letting plants grow bigger (B).



## Denser plantings

A consistent message from this research is that, whatever the origin of the plants, more is better: the greater the volume of vegetation, the more invertebrates of nearly every kind were found on the plots. Again, there are two ways to increase volume:

- ◆ plant more densely (works well on more fertile soils, where watering and budget allow);
- ◆ let plants grow bigger to fill the space (takes a little longer than denser planting but is cheaper and less demanding on aftercare).



A bird's-eye view of vegetation density in two of the 3 x 3m Plants for Bugs plots, with a grid of 30 x 30cm squares superimposed. Plot 1 is sparsely planted: approximately 50% of the squares show soil and 50% show vegetation. By contrast, plot 2 is densely planted, with 90–100% of the squares filled with plants. We would expect this plot to support more plant-dwelling invertebrates than plot 1.

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