

# Garden Plant Ecology

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Plants are at the base of every garden food web, which is why the BUGS project<sup>1</sup> found an overwhelming influence of the quantity of plant material on the abundance and diversity of animals in gardens. Gardens with lots of trees, hedges and big shrubs, i.e. essentially an abundance of green plants, had the biggest and most diverse populations of most groups of animal<sup>2</sup>.

## Light

All plants, and thus all terrestrial ecosystems, are powered by the sun, so light is fundamental. In the UK the greatest amount of light energy is received in June, with a bit less in May and July, while outside this period light falls off rapidly. There is little you can do about the amount of sun your garden receives, but gardeners have a huge influence on how much of the sun's energy is captured by their garden, and the amount and type of plant material produced – an influence that has far-reaching effects on the rest of the ecosystem.

## Soil nutrients and water

Given sufficient warmth and sunlight, plant growth is controlled by nutrients and water. Natural and semi-natural habitats vary a lot in the availability of both. Habitats that suffer chronic shortages of either (sand dunes say, or heathland) tend to support plants that grow slowly, which is readily apparent from the fact that they vary rather little in appearance between winter and summer; plants that are short of water or nutrients are unable to take advantage of the big peak in light energy in midsummer, so there is no very noticeable summer surge in growth.

Gardens vary a lot less in this respect than different kinds of more-natural habitats. That's because a nutrient-rich soil has always been (and remains) the aim of most gardeners and, however dry your garden might be if left to itself, that can always be modified by irrigation (equally, a naturally soggy garden can be improved by drainage). Therefore most gardens have plenty of water and nutrients, which makes them ideally suited to fast-growing plants. Indeed, fertiliser advertisements often emphasise how much faster (and bigger) your plants will grow if you buy their products. Most gardeners seem to share the assumption of fertiliser manufacturers that bigger equals better, and certainly there are places (the vegetable plot, for example) where this is generally true.

## Fast and slow-growing plants

But many garden plants naturally grow quite slowly, and this includes a lot of 'choice', expensive and difficult to propagate species, such as alpines and many dwarf or evergreen shrubs. These naturally slow-growing plants will respond only a little, if at all, to extra fertiliser. On the other hand, lawns and fast-growing plants will need more mowing and pruning in a fertile garden, and weeds will grow faster, while many herbaceous plants will grow taller and need more staking. The response of lawn grass to fertility is one of the reasons why it is difficult to create wildflower meadows in gardens. Finally, although fast-growing plants may shrug off the effects of herbivores, lots of soft, juicy foliage will attract more plant-eaters in the first place.

## **Plants and garden management**

However, although abundant soil nutrients and water provide the potential for rapid plant growth, management controls how much vegetation there is, and it's this that really determines the size and diversity of the animal community in your garden. Consider, at one extreme, a gardener who grows mainly bulbs, annuals and bedding plants. These plants never get very big, so there's never very much to eat, and in the winter there's hardly anything, which also means nowhere to hide. Recall that in the real world in which animals evolved, bare ground is a rare and unusual phenomenon, confined (outside deserts) to brief periods after major disturbances such as fires, floods or landslips. A garden with a lot of alpines will also fail to sustain much of an ecosystem; although such plants are permanent fixtures, they tend to be even smaller (and tougher) than annuals, and provide correspondingly little to eat.

However, if you recognise yourself as one of either of these types of gardener, don't despair. Even hot, bare soil or gravel will provide good conditions for some animals, and these may well be unusual species that fail to gain a foothold in neighbouring, better-vegetated gardens. A remarkable feature of gardens is their huge diversity, and in providing habitats for insects and other animals, all have their role to play. Bulbs, annuals and alpines will also provide good seasonal nectar sources for visiting pollinators from other gardens.

### **Plant size and permanence**

At the opposite extreme, opportunities for herbivores (and their predators) really begin to multiply as plants become (a) bigger and (b) more permanent. One reason oak is often held up as a resource for so many native herbivores is that it excels in both of these departments. Because oak is so universally and reliably available, and in such large quantities, it has been adopted as a food source by many insect herbivores. Oak's response to this onslaught has been to evolve defences that are moderately effective in reducing consumption by a wide range of plant eaters, without completely deterring any of them. Basically, oak leaves are tough and full of tannins, which makes them taste bitter (and not just to you and me). Smaller, short-lived plants rely instead on more specific defences that are very effective against the average generalist herbivore, while hoping to avoid detection by the few specialists that have evolved to deal with these defences. The chemical defences of brassicas and ragwort mean they don't have many enemies, but they can still be seriously damaged by the caterpillars of large and small white butterflies and the cinnabar moth respectively.

### **Trees, lichens and moths**

Trees, shrubs, hedges and woody climbers aren't just food, they are also living space, or habitat, which in turn sometimes leads to the provision of completely new sorts of food. Most of Britain's 2000-odd species of moths are declining<sup>3</sup>, but one group bucking the general trend is those whose caterpillars eat lichens. Lichens were very badly affected during the 20<sup>th</sup> century by air pollution, particularly in towns and cities, but they (and the moths that eat them) are now staging a recovery. Rocks and tree bark are two of the major habitats for lichens, so both trees and stone walls provide lichen habitat in gardens. Moths whose caterpillars eat conifers are also generally doing well, largely because of ornamental conifers grown in gardens. Birds that like conifers, such as siskins, are also doing well, partly for the same reason, and partly owing to the maturing of conifer plantations outside gardens.

Perhaps even more importantly, old trees with rough bark and dead boughs provide numerous hiding places for overwintering insects, food for the wood-feeding larvae of many beetles and nesting sites for birds. The gardener with any concern for wildlife should always think very hard before removing an old tree, however moribund.

## **Herbaceous borders**

In the herbaceous border, management also largely determines the number and diversity of herbivores supported. A wide range of insects live (especially as larvae) in plant stems or seed heads, many more rely on dead plants to provide hiding places during the winter, while many birds eat plant seeds. The gardener who routinely cuts down and clears away herbaceous plants as soon as they have finished flowering is removing the food and habitat of all these species. From a wildlife perspective, the best course is to do nothing, and clear up only when new growth starts in the spring. For the gardener who just can't bear that level of untidiness, an alternative is to cut down dead plants in autumn and leave the remains *in situ*. It doesn't look very tidy during the winter, but new growth soon covers up the mess in spring.

## **Grass**

Grass is pretty common stuff, something that has not gone unnoticed by insect herbivores. Lots of insect herbivores are grass-eating specialists, including several of our commonest butterflies and a very large number of moths. On the other hand, most of these herbivores find the average garden rather uncongenial, because mown grass (unsurprisingly) doesn't really provide what they need. Indeed grass is a prime example of what you grow being less important than how you grow it. Long grass – cut once a year – is one of the most important contributions you can make to the garden ecosystem.

## **Aquatics**

Aquatic plants, of course, occupy a specialised habitat, and one that may not even exist in many gardens. A healthy pond ecosystem depends on plants that perform a range of unrelated functions. Submerged plants make a major contribution to oxygenation, on which all other pond life depends. Newts also require submerged plants on which to lay their eggs. Floating-leaved plants, such as water-lilies, help to keep the water cool and dark, which helps to prevent the growth of algae, so you should aim for 50% coverage of your pond by floating plants. Finally, emergent plants are essential if you want to persuade dragonflies or damselflies to breed, since their nymphs need emergent plants to crawl out of the water.

*Reviewed by Steve Head*

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<sup>1</sup> See [www.bugs.group.shef.ac.uk](http://www.bugs.group.shef.ac.uk)

<sup>2</sup> Thompson, K. (2007) *No Nettles Required. The Truth about Wildlife Gardening*. Transworld, London.

<sup>3</sup> <http://butterfly-conservation.org/1776/the-state-of-britains-moths.html>