



Composting and peat-free gardening

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Lowland bogs both here and abroad are being destroyed by peat cutting. Peter Wakely/Natural England

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Many gardeners don't think twice about using peat and can't imagine using anything else, so they might be surprised to learn that it is a relative newcomer to the horticultural scene. In fact, peat only started to be used widely in the 1950s. Sadly, this led directly to the destruction of some wonderful wildlife habitats in Britain. While some of our remaining peatlands are now protected, there are many in other European countries that aren't, and it is these that now supply most of our garden peat. This leaflet explains the value of wild peatlands and what will be lost if gardeners continue to use peat. It also explains what alternatives exist and how to use them.

Where does peat come from?

Peat forms in waterlogged conditions where the lack of oxygen prevents dead plants from decaying fully. Plants such as sphagnum mosses, bog cotton and heathers grow and die on the bog surface and layers of this dead plant material gradually accumulate over thousands of years. The weight of the upper layers then

slowly compresses the lower ones to form peat. In the UK, peatlands cover 1.6 million hectares. Around 95 per cent of this area is upland blanket bog, the remainder consisting of lowland raised bog. It is the lowland bogs that are used for peat extraction and of the 70,000 ha left, less than a tenth is in pristine or near natural condition.

Why is peat important?

Peat bogs form some of England's most scarce habitats and provide a unique home for many native plants and animals, as well as stopping-off points for migrating birds. Peat bogs also contain a lot of important scientific information. By extracting cores of peat and examining the different layers, we can tell what our landscape used to be like and what types of plants and animals lived there. We can also find out about past weather conditions, helping us to understand current trends such as global warming. The loss of peatlands can also contribute to the global warming process; they form an important 'carbon sink', holding more carbon than all the world's forests. As peatlands degrade, this carbon is released into the atmosphere.

Processing peat. Peter Roworth/Natural England



Uses of peat

Humans have used peat for centuries as a fuel, a building material, for animal bedding and, more recently, for horticulture. In the UK, gardeners and commercial growers get through 3.5 million cubic metres of peat a year. To meet this demand, areas of lowland bog are being stripped of their peat, destroying valuable habitats both here and abroad (65 per cent of our peat is now imported). Because peat bogs take so long to form they are an unsustainable resource. If we continue to destroy these peat habitats we will ruin a vital part of our natural heritage, lose many rare plants and animals, and valuable information about our planet's past.

Peat in the garden

Peat has three uses in the garden: as a mulch, a soil improver and a growing medium.

Mulches

A mulch is a layer of material spread on top of the soil to keep down weeds, conserve moisture and insulate the earth. Peat-based mulches do a relatively poor job as they break down quickly in dry conditions and often just blow away. Better mulches are based on bark, leaf mould, recycled wood waste, spent mushroom compost or garden compost.



Vertical text: Garden compost makes an excellent soil improver. Anne Brenchley/Natural England



A wetland dweller: the purple-bordered gold moth . Roger Key/Natural England

Soil improvers

These can be used to add organic matter to the soil, to help break down heavy soils or bind lighter ones. They add nutrients and increase the biodiversity of soil, encouraging beneficial organisms such as earthworms. Peat-based soil improvers can improve soil texture and increase its ability to retain water but nearly all peat-free soil improvers can do the job better. Peat-free improvers are usually based on wood waste, spent mushroom compost, garden compost, leaf mould or farmyard manure.

Growing media

In the UK, 96 per cent of horticultural peat is used in growing media. Around two-thirds of this is used by domestic gardeners. Most growing media are given the catch-all title of 'potting

compost'. However, they are rarely 'true' composts and should perhaps be referred to as 'compotes' – mixtures of materials such as loam, peat, sand and fertiliser. Peat actually makes a very good growing medium as it is a bland substance that behaves in a predictable way. It can cope with over- and under-watering, and its relatively low pH and uniform nutrient levels mean that manufacturers can fine-tune their 'compost' recipes to meet different needs. Many peat-free growing media are now available to the domestic gardener. Some peat-free products had a bad press in the past but new formulas, materials and manufacturing techniques have resulted in growing media that equal and often excel those based on peat. However, their success depends on following the instructions – especially for watering and feeding.

Peat substitutes

Bark and wood waste

These by-products of the timber industry are usually used for mulching and, when composted, for soil improvement. Composted wood fibre is sometimes used as a bulking agent in low-peat potting composts.

Spent mushroom compost

This is a mixture of wet straw, chicken litter, horse manure and gypsum that is then composted to high temperatures to sterilise it. It is an excellent improver for heavy soils but is not used in growing media due to its high nutrient content and pH.

Biosolids

The new name for sewage sludge! Untreated sewage used to be ploughed into agricultural land as a soil improver and fertiliser, but due to the health risk only treated sewage is now used this way. Standard 'treated sewage' has had 99 per cent of its bacteria destroyed, while 'enhanced treated' sewage increases this proportion to 99.9999 per cent! Enhanced treated sewage is virtually sterile. There's no reason it shouldn't be used in the garden but, at present, it is not available to domestic growers.

Simple plastic compost bins can be very efficient. Wiggly Wigglers



Coir (coconut fibre)

Although we think of this as a 'new' product it was widely used before peat came on the gardening scene. In 1951 the RHS Dictionary of Gardening described coir, stating: 'There is nothing that can quite take its place, a good peat being the nearest.' Coir is most often used as a bulking agent in peat-free growing media, but it has a relatively high pH so is not suitable for ericaceous species and conifers. In the past, coir was sometimes considered unreliable due to the presence of pathogens, or salt-water contamination that occurred during transportation. Today, improved quality-control has made coir a far more consistent product. Some plants, such as fuchsias, actually prefer coir to peat. In addition to coir, shredded coconut shells are sometimes used as a mulch. A negative aspect of these products is that they are imported from Sri Lanka; it's a long trip that has an environmental cost.

Composted waste

Compost is very variable in composition and tends to be quite acidic, with high nutrient levels. It is most useful as a soil improver but is increasingly being combined with other materials to make growing media.

Composted bracken

When composted at high temperatures, bracken can be used as a soil improver or mulch. It is less useful as a growing medium as it has poor water retention. For this reason bracken-based growing media are usually blended with peat or coir.

Animal manure

Mixed with straw and composted for at least six months, manure makes a very good soil improver but is too nutrient-rich to use as a growing medium without dilution. (See also Composting animal manure, page 14.)

The traditional compost heap, an asset to any garden. Silvestris Fotoservice/FLPA



Leaf mould

Composted leaves make a good soil conditioner and can be used in growing media. Some John Innes recipes have recommended leaf mould as a substitute for peat see also Making leaf mould, page 17.

Spent hops

These are a by-product of the brewing industry. They have little nutritional value but are useful as a soil conditioner. They are strong smelling and unsuitable as a mulch or growing medium.

Read the label!

When buying potting composts and soil improvers, always read the label carefully. Some products labelled 'green' or 'organic' actually contain peat, so look out for the words 'peat free'. If you're buying a 'low peat' product, find out what 'low' actually means!



There are now many excellent peat-free growing media. Fiona O'Mahony/Natural England

Making compost

Garden compost is made from recycled kitchen and garden waste. Apart from helping gardeners use less peat, composting also reduces the amount of land used for rubbish disposal. Roughly 25 per cent of domestic waste consists of food scraps, and much of it can be composted rather than going to land-fill (not to mention other compostable materials such as paper and cardboard). Once made, compost is best used as a soil improver, dug into the topsoil to add nutrients and introduce organic matter. Those who prefer not to dig can add compost in the form of a mulch spread over the soil surface. Nutrients will leach into the soil as the compost decomposes and worms will drag organic matter into their burrows.

Garden compost can even be used to make growing media. One recipe suggests a mixture of 2 parts compost, 1 part loam/good soil and 1 part leaf mould or coir. A trial by *Gardening Which?* found that a good growing medium could be made by combining 6 parts garden compost, 1 part sand and 1 part 'John Innes No 1' (itself a combination of 7 parts loam, 3 parts peat and 2 parts sand, plus various nutrients). *Gardening Which?* has also recommended leaf mould (or a 50:50 mix of leaf mould and soil)

as a sowing compost; a mixture of equal parts garden compost, soil and leaf mould as a potting compost; and a 50:50 mix of garden compost and soil as a container compost.

Even if you don't make garden compost yourself you can always get hold of some; many local authorities sell compost made using waste from domestic gardens and local greenspaces.

Heap or bin?

The simplest way to compost garden and kitchen waste is to pile it in a heap and let nature take its course. While this arrangement will suit many, others might find an unfettered heap an eyesore. Another

factor is heat – a pile of garden waste will rot down more quickly if it is warm, and putting waste in a bin will help insulate it.



An attractive 'beehive' composter can be a garden feature in its own right. Wiggly Wigglers

Composted waste has high nutrient levels. Fiona O'Mahony/Natural England



A simple compost bin can be made with four wooden stakes. These are stuck in the ground to form a square with a base area of 1 x 1 m. Three sides of this square are then fenced in with a mesh (chicken wire, for example) and the garden and kitchen waste piled in. Keeping one side open allows easy access for turning or moving the compost. To conserve heat, the mesh can be lined with old plastic sacks and the heap covered with plastic or old carpet (though carpet with an integral underlay should not be used as this is often impregnated with insecticides) A cover will also keep out excess rainwater. Ideally, a contained heap like the one described above ought to have a volume of at least one cubic metre as this size will retain heat without being too much to handle. A more robust wooden bin like the one illustrated is fairly easy to make if you have the tools. Using this design, you make a number of identical wooden squares from boards (cut to

Making a compost bin is a useful DIY project.
John Lincoln



Covering your bin will insulate it and keep out excess rainwater. Wiggly Wigglers

75 cm lengths), then slot the squares together, one on top of another, to make an open-topped box. This means that the height of the box can be increased as needed and it can be quickly disassembled to get access to the compost. Thick boards (2 cm plus) will be easier to screw together than thin ones and make a stronger structure, though the corner blocks used to 'peg' the squares together will also provide support.

If you don't want to make your own, there are many commercial compost bins on the market. These range from decorative wooden 'beehive' bins to utilitarian plastic containers. Some more advanced models are on rollers that allow you to mix the compost by tumbling it. This should be done every day to achieve the best results. No clear favourite has emerged from testing these designs; it seems that the quality of your compost will depend far more on the ingredients used than the container.



You can now buy containers specially designed to store compostable kitchen waste. David Williams/Natural England

What to compost

Almost any organic matter can be composted as long as it is not meat scraps or cat/dog faeces. The former attract rats, while the latter can transmit diseases to humans. For best results, everything added to the heap should be chopped-up or shredded as finely as possible. Most organic household waste consists of garden waste and kitchen scraps. This can be divided into two groups: the 'Greens' and the 'Browns'.

Greens

These include vegetable peelings, weeds and grass clippings; in fact, any soft vegetation. This material contains a lot of water and is high in nutrients such as nitrogen.

Browns

These include woody prunings, stems, tree leaves, cardboard, shredded paper, egg boxes etc. This material is relatively dry and contains little nitrogen, but is rich in carbon.

Other things that can be added to your heap include vacuum cleaner

dust, tea bags, coffee grounds and eggshells (though the latter don't 'compost' as such). Although it is not recommended that you add cooked food scraps to your bin, a few boiled vegetables won't hurt as long as they are not mixed with dairy products or meat. If you have a lot of cooked food scraps it might be an idea to install a kitchen waste-disposal unit that will grind them up and flush them into the sewage system. Disposal units reduce the amount of food waste going to land-fill but have an environmental cost in terms of energy use.

The key to good composting is to mix greens and browns in roughly equal proportions. In the first stage of the composting process, much of the work is done by bacteria that use the nitrogen in the greens to break down the carbon in the browns. To do this efficiently, bacteria need heat, moisture and air.



Even some compost bins are compostable. *Gardening Which?*

Heat

A healthy compost heap will generate a lot of heat, and covering it, or containing it in a compost bin, will help trap the warmth. Putting your heap in a sunny spot will also help, but if it is too exposed it may dry out.

Moisture

Keeping your heap or container covered will allow you to control its moisture content, but be careful it doesn't get too dry; on the other hand, if your compost becomes waterlogged it will be deprived of air. In both cases the composting process will slow dramatically.

Air

In the initial stages of composting, much of the work is done by 'aerobic' bacteria (those that need oxygen). Later in the process, worms will become important. Both need air to live. Some commercial compost bins have holes in them for aeration, but these may be counter-productive and let out too much heat. An active heap or bin should create its own flow of air, with the heat it generates rising up and drawing fresh air into the base. Large heaps have to be turned regularly to let air into their centres, but you can help a smaller heap by not compacting the compost and introducing a small amount of twiggy material to help keep its structure open. If you have a large amount of compost to deal with, form it into a 'windrow'. A windrow is an elongated heap about 1.5 metres tall, 2.5 metres wide, and as long as is necessary.

Many gardens will support more than one compost bin. *Anne Brenchley/Natural England*



The three stages in compost production

In some heaps, the conditions for composting are never quite right and the material breaks down only very slowly. This is not an ideal state of affairs but the heap will eventually produce usable compost. On the other hand, a good heap should compost in three stages:

Heat stage

Most of the work is done by fungi and bacteria. They multiply rapidly and break down organic matter by digesting it. These oxygen-fuelled micro-organisms work quickly and generate a lot of heat – sometimes sufficient to kill weed seeds and pathogens. Compost can start to dry out at this stage, so keep an eye on it.

The compost worm *Eisenia fetida*, also known as the brandling or tiger worm. *Roger Key/Natural England*



Worm stage

After the bacteria and fungi have done their work, the heap cools and earthworms and compost worms – also called brandlings or tiger worms – consume what is left, mixing the compost fragments within their guts. At this stage the compost can be used as a mulch or fertiliser for heavy-feeding plants. Under ideal conditions these first two stages can be completed in two weeks. If compost worms have not yet found their way to your heap, you might consider buying some. (See *Wormeries*, page 16.)

Ripening stage

Over six months to a year, a variety of soil organisms gradually ripen the compost, breaking it down further and sifting it, turning it into a crumbly fragrant humus.

Composting animal manure

Dog and cat faeces should not be composted as both can transmit diseases to humans (the same applies to nappies). However, the dung and litter of herbivorous pets such as gerbils, hamsters and rabbits can be added to your compost, as can chicken litter.

In all these cases the mixture of nutrient-rich dung and carbon-rich litter (straw, wood shavings etc) will be of great benefit to your heap.

Manure from larger animals such as horses can also be added to the heap, but too much might overwhelm it.

It's often best to compost horse manure separately. Stephen Arnott/Natural England



Large amounts of horse manure are best composted separately.

Mix it with plenty of straw and cover it to prevent rainwater leaching out too many nutrients. Composting can take a year, but once the manure and straw is well-rotted it can be added to the soil as an improver (fresh dung should not be added to the soil as its high nutrient levels can scorch young plant roots).

Starters/accelerators

Some compost heaps never seem to get going. In these cases they are either too wet or too dry or, more likely, they have a poor nitrogen/carbon (green/brown) balance (see What to compost, page 11). If your



Compost bins come in all shapes and sizes. Fiona O'Mahony/Natural England

What not to compost:

- **meat and fish scraps**
- **cooked food scraps**
- **cat and dog faeces**
- **nappies**
- **perennial weeds**
- **ash from coal or coke**
- **diseased plant material**
- **glossy or colour-printed paper/cardboard**
- **synthetic and non-organic materials.**

heap consists mainly of kitchen scraps and/or grass clippings, there is probably too much nitrogen and water in the mixture. Try turning the heap and adding dry 'browns' such as shredded newspaper, cardboard, egg boxes etc. This will add carbon to the mix and help break it up and aerate it.

If your heap contains too much dry and woody material, it might need some help in the form of a 'compost starter' or 'accelerator'. These can be bought from garden centres and consist of a mixture of composting micro-organisms and nutrients, especially nitrogen. You can make your own starter by soaking nettles or comfrey leaves in rainwater for a couple of weeks and pouring the resulting stew on your heap. Alternatively, you can use diluted urine. These nitrogen sources will stimulate the composting bacteria and fungi in your heap.

Trench composting

Rather than build a heap, you can also make compost in a trench. Dig a trench approximately 30 cm deep and backfill it with alternating layers of compostable material and soil. Finish off with a thick layer of soil and leave the trench for at least two months. Once the trench has settled you can use it to grow heavy feeding plants that will enjoy the moist nutrient-rich conditions. Ideal crops to grow this way include runner beans, peas, courgettes and pumpkins.

Wormeries

Worm composting is different from traditional composting as there is no heat-producing bacterial stage. All the work is done by compost worms called brandlings *Eisenia fetida* (also known as tiger worms) and their relatives *E. hortensis*. These worms are available from specialist suppliers. Brandlings are found in the wild and will often colonise a garden compost heap. Since brandlings specialise in living on rich organic waste and do not live in the soil, how they actually find new heaps is a mystery; perhaps visiting birds carry brandling eggs on their feet. A basic wormery is a plastic bin containing an internal divider of fine mesh supported 20 cm or so above its base. Kitchen waste is disposed of in the bin and the worms

consume it in the darkness. The end product is a nutrient-rich liquid that drips into the bottom of the bin. This liquid is drained off every so often via a tap and used as a liquid fertiliser. An advantage of the system is that it is totally enclosed so it is less messy than a traditional compost heap. It can also be kept indoors. There are many commercial wormeries on the market, or you can make your own.

Some wormeries are quiet sophisticated. Wiggly Wigglers



Making leaf mould

Leaf mould is an excellent mulch and soil improver and can be used as an ingredient in home-made potting composts. The easiest way to make leaf mould is to collect autumn leaves in a black plastic sack. Water the leaves well, then tie off the sack and puncture it to make a few small air-holes. Store your sacks in a corner of

the garden, and in a year or so the leaves will have broken down into a rich humus. Alternatively, make a mesh container as described in the section 'Heap or bin?' (page 9) and reserve it specifically for leaves. To accelerate the process, chop up the leaves beforehand, perhaps by running a mower over them. Using evergreen leaves will result in a mould ideal for use with acid-loving plants.

Leaf mould has many uses and is easy to make. Fiona O'Mahony/Natural England



Contacts

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enquiries@naturalengland.org.uk
www.naturalengland.org.uk

The Composting Association

Tel: 0870160 3270
www.compost.org.uk

Garden Organic (formerly the HDRA)

Tel: 024 7630 3517
www.gardenorganic.org.uk

Peat-free compost suppliers

The following companies all include peat-free composts in their product ranges: B&Q, Focus, Gem, Homebase, J Arthur Bower's (now called New Horizon), Levington and Westland.

The following companies specialise in the manufacture of peat-free growing media:

Fertile Fibre

Tel: 01432 853111
www.fertilefibre.co.uk

Terra Eco Systems

Tel: 0118 964 0301
www.terraecosystems.com

Composting equipment suppliers Blackwall

Tel: 0113 201 8000
www.blackwall-ltd.com

Ferndale Lodge

Tel: 0870 444 1342
www.ferndale-lodge.co.uk

Organic Gardening Catalogue

Tel: 0845 130 1304
www.organiccatalog.com

Queenswood

Tel: 01568 611 281
www.queenswood.co.uk

Two Wests and Elliot

Tel: 0870 4448274
www.twowests.co.uk

Wiggly Wigglers

Tel: 0800 216990
www.wigglywigglers.co.uk

Further Information

This is one of a range of wildlife gardening booklets published by Natural England. For more details, contact the Natural England Enquiry Service on 0845 600 3078 or e-mail enquiries@naturalengland.org.uk

Natural England also produces *Gardening with wildlife in mind* an illustrated wildlife reference. Originally on CD but now also available on-line, *Gardening with wildlife in mind* has detailed information on 800 plants and animal species often found in our gardens, and shows how they are ecologically linked. See www.plantpress.com

Compost fodder; bracken is plentiful and an invasive weed in many habitats. Peter Wakely/Natural England



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