# Sustainable Gardening
# Good for us
# Good for our Wildlife

We are all in unknown territory, almost no one living today has experienced a global pandemic and the climate crisis is of ever-present concern.  Added to this is the loss of a terrifyingly large number of plants and animals which create a balanced ecosystem. Not a happy picture!

What has gardening to do with this? It helps to sustain us in these challenging times and also, if carried out sympathetically, can be of enormous benefit to our wildlife.

In the past twenty months or so it has been shown how important it is for our well-being to get outdoors into green places.

# 27 million gardeners:
# 35% growing food
# 9 million feeding family, friends & neighbours

As a gardener, you are one of **27 million** people in the UK who are busy with their patch of earth.  Of these, **35% grow food** - so that is approximately **9 million** of us planting allotments, window boxes or our garden to feed ourselves, our families and in all likelihood, our friends and neighbours will share the spoils when there is a glut of courgettes or runner beans. I mention growing food now, because HOW we grow our food is vitally important.

# Small is beautiful!

You don't need a large garden to enjoy growing plants – I spotted this mini-garden by the garages in **Oakthorpe Place.** Oxford is fortunate in having **allotments** and we would welcome you to join our **gardening team** here at St Michael's

Gardening is good for both our physical and mental health. It is linked to longer lives.

Regular access to **green** spaces lowers our **blood pressure, reduces heart rate, stabilises blood glucose** and the **reliance on anti-depressants.** Think about the varied exercise when gardening **– stretching** to prune or lop, **bending t**o plant, weed, **digging, raking, keeling, pushing the wheelbar-row,** pulling out unwanted plants – it all adds up to a good "work out".

Indoors we focus on one activity, in recent months this has all too often been the computer – using sight and hearing on Zoom.

When you are **outdoors**, all your senses are simulta-neously stimulated. Your **ears a**re assailed by **sounds** a quote from Nan Shepherd "Hearing with-out listening" expresses this so well.

# Engaging the Senses

The rustling of **fallen leaves** in autumn, patter of **raindrops, thrum of** insects, and even the **metallic clang** made by the movement of tools. And of course, bird **song**.

A couple of years ago, as we walked into the RSPB Reserve at Otmoor, we caught up with an elderly couple walking extremely slowly. After exchanging greetings, the gentleman remarked that they always visited Otmoor in May and if he heard a cuckoo, he reckoned he had another year of life. At which point “cuckoo, cuckoo” sounded close by – big smiles all round!

# Smell

Everyone is familiar with the smell of **newly cut** grass,

**fresh rain upon the Earth**

**perfume of flowers – roses, sweet peas**

There is **less noticeable**, but never the less an **aroma from the vegetation** – shut your eyes and you can immediately tell if you are indoors or out in the garden. **Leaves, fungi and micro-organisms** are **constantly emitting molecules called Phytochemicals.** These are the plant's **defence mechanisms** and by inhaling them, we boost our own immune system.

You may be familiar with the strong odour of **foxes** which have marked their territory. The scent from other animals is harder to pick out and recent research has shown that animals can be identified by their DNA in the air close by. All these join in the molecular **pot pouri** which enters our noses.

# Sight

Who can fail to be delighted seeing the first snowdrops in early spring or rejoice in the blossom later on, which is particularly lovely on the trees in gardens and along the roads in of North Oxford

# Watching and Waiting

If you have a **bird box**, no doubt you wait with bated breath – will it be occupied this year and if so, will the young fledge?

This is an unhatched bluetit egg from one of our bird boxes. It is quite incredible to think that a tiny bird emerges from an egg this size and in two and a half weeks is fledged and can fly to the bird feeder.

**Autumn** is the time of **glorious colours** and we hopefully see redwings and fieldfares feasting **on rowan and other berries.**

# Touch

You will certainly be aware of the feel of a breeze upon your skin and sunlight warming it.  You can certainly feel if a fly lands on your hand.

FINGER TIPS have a multitude of sensory nerve endings.

Go outside, close your eyes and try touching the bark of different species of trees.

At the end of summer, who cannot resist picking fallen **conkers**, breaking open the prickly shell and stroking the smooth shiny conker within?

All these sensations feed into your nervous system and act as a stimulant.

# The Living Mountain

Touch is brilliantly expressed by **Nan Shepherd** in her book **The Living Mountain** and quoted by **Robert McFarlane** in **Landmarks**

*"The hands have an infinity of pleasure in them. The feel of things, textures, surfaces, rough things like cones and bark, smooth things like stalks, feathers and pebbles, rounded by water, the teasing of gossamers……the scratchiness of lichens, the warmth of the sun, the sting of hail, the blunt blow of tumbling water, the flow of wind – nothing that I can touch or that touches me but has its own identity for the hand as much as for the eye."*

# Picking fruit

Come **Blackberry** time, what fun picking fresh berries as you walk in the countryside and tasting the sweet juice.

# Taste

If you grow your own **vegetables, fruit or herbs,** you will be familiar with the incredible flavour of **just-picked and eaten produce.** It has an extra layer of taste.

Here one of our granddaughters is enjoying mangetout in the garden.

# The Bad News

That is the **good news** – the **bad news** is that in the UK we have seen a **dramatic decrease** in not only the **numbers** of animals – everything from invertebrates - to birds and mammals, but also, the **variety and abundance** of beautiful wild flowers and

other plants considered to be “weeds” and therefore considered a legitimate target for elimination.

# Fungi and Lichens

**Fungi and lichens** have not been spared; all are in decline.

# Air Quality

**Gravestones** in churchyards are good indicators of air quality. Before the Clean Air Act, the predominant lichen on gravestones in suburban churchyards were those which were tolerant of the sulphur in smoke from coal fires.

Today, those same stones grow lichen which are tolerant of nitrogen dioxides from car exhausts.

In the countryside, **hedgerows** have been ripped up (initially with the incentive of government subsidies, now thankfully, reversed) **scrubland** has been lost, **ponds** filled in and **hay meadows turned over to silage crops and grass leys.**

# Insects

## *In the past 50 years we have lost 75% of our insects*

This **simplification of the landscape and intensification** of farming, with the **widespread use of chemicals** to control so-called pests either plant or animal has resulted in a **staggering loss of insects, 75% in the past fifty years**. In 1962, Rachel Carson's book **Silent Spring** was published, documenting the **appalling results of indiscriminate use of pesticides**. We don't seem able to learn the hard truths.


The knock-on effect of the combined **habitat destruction** and **widespread use of chemicals** has been a dramatic reduction in the **numbers** of farmland and garden birds – over the past half century Britain has lost 44 million breeding birds. Wild flowers and also invertebrates are lost, making the countryside in many areas into an arable desert.

# Insects pollinate our crops

We need insects to **pollinate our crops** about 75% of our food relies on insect pollination. *NOT ONLY THAT ….*Together with **bacteria and fungi they recycle dung, leaves and corpses & keep the soil** healthy.

Without these **natural recyclers**, we would drown in dead animals and vegetation. How often do you see a dead bird or mammal apart from driving along the A34, which is death-trap for so many badgers & Muntjac – very rarely. The natural world has its own very efficient undertakers and recyclers.

This photo of a small badger that died in Helen Dodd's Garden last summer.  We think from heat exhaustion in the June heatwave.

Within hours, flies laid eggs which hatched into maggots and were consuming the carcass.

Other larger animals – birds, fish, amphibians and some mammals rely on insects for food and wildflowers need insects for pollination.

As insects become scarcer, our world will slowly grind to a halt as it cannot function without them.

# Food Chain

At the base of the food chain are herbivores **caterpillars, aphids, caddisfly larvae and grasshoppers** which turn plant material into tasty protein for larger invertebrates such as **wasps and beetles**.

These in turn are prey for **birds, bats, spiders, reptiles, amphibians like frogs, small mammals such as shrews and fish such as trout**.

In turn, the top predators such as **sparrow hawks** and **heron** prey on these animals.

# What can we do about this?

Well, **87% of households** have a garden of varying size, which together makes **23 million gardens covering an estimated 485,000 hectares.**

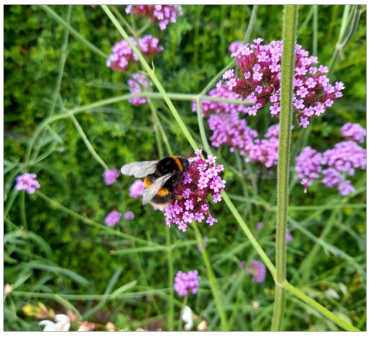
This is **three times** the size of all the RSPB Reserves. That is a lot of land, which, if **nurtured correctly** could provide the space which our wildlife so desperately needs.

Unfortunately, new houses tend to be built with smaller gardens and there is a fashion for **paving over** front gardens to provide parking space, or even worse, **replacing turf with** artificial grass.

These measures all **reduce the options** for any wildlife which might be **seeking sustenance or shelter**.

# What can we do?

We are **part of the biosphere** and our actions have a **dramatic and lasting effect on the environment.** What can we do? The answer is to make space for what is called The Natural World - a term I dislike as it suggests that we are not part of it. We are part of the natural world, but unfortunately, we humans are **exploiting and ruining** it and this is having a **devastating effect on the whole eco-system** of the planet.

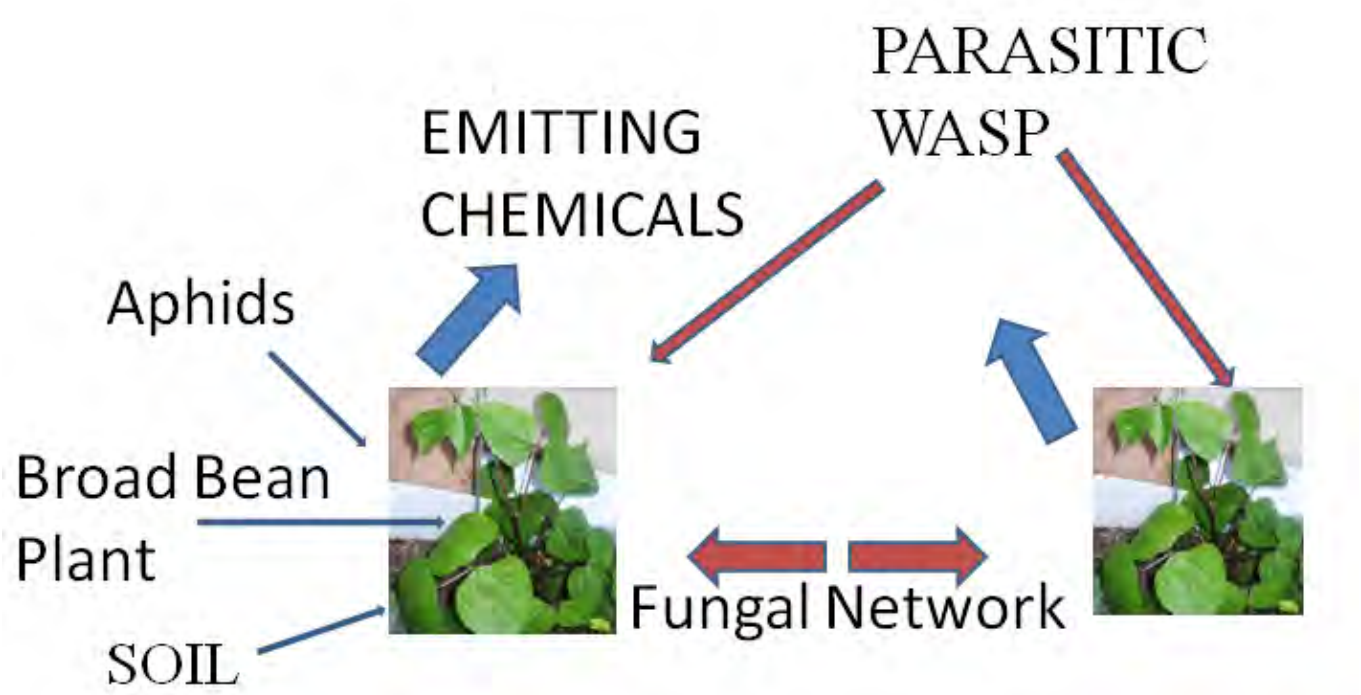


Given the right conditions, in other words, the **correct habitat,** we can welcome into our gardens birds, amphibians, a huge range of insects including **bees, butterflies & moths.**

**Hedgehogs will visit the smallest garden if there is a safe route in and out.**

# Starting with the soil

In the past twenty years or so it has been established that over 90% of plant species depend on **mycorrhizal fungi**. These are tiny fungal threads which wrap around and within plant roots and link between plants of the same species and plants of different species.




If **broad beans** are attacked by **aphids, they release plumes of volatile compounds** an example of phytochemicals mentioned earlier.

These drift around and attract **parasitic wasps** whose larvae prey on aphids. Plants connected by a shared fungal network **ramp up their production of the volatile defence compounds,** even when they themselves are not yet attacked. The information passes between plants along this mycorrhizal network.

# More on Fungal Network…..

If you wish to learn more about the close association between fungal networks and plants, I recommend two books:

**Entangled Life** by **Merlin Sheldrake**

**Finding the Mother Tree** by **Suzanne Simard**

The widespread use of **chemical fertilisers and fungicides disrupts** this mycorrhizal association, reducing the health of the soil and in turn the health of the plants and the production of crops.

This fungal network is sticky – it holds the soil together, increasing the volume of water it can retain, and also carbon in the soil.

# A teaspoon of healthy soil …

A **teaspoon** of healthy soil (i.e. not contaminated by chemicals, will contain more bacteria, protists (i.e. single celled organisms which are neither animal, plant or fungi) and minute invertebrates than the total number of humans that have ever lived on earth. This is a staggering fact.

When I **learnt about** parasitic wasps attacking the aphids which plague my broad beans, my immediate reaction was "**How do I attract these wasps into my garden**?"

There are many different species of parasitic wasp, some so tiny, some you can scarcely see with a naked eye.

# How to attract parasitic wasps into your Garden

1. Grow plants to attract them: cosmos, lemon balm, yarrow, alyssum, allium, marigolds, lavender & rosemary— *try to grow plants so there are flowers throughout the year for all pollinating insects*
2. Shelter from high or low temperatures
3. Water—even a shallow bird bath is sufficient

Plant flowers with nectar to attract them is a first step. But because they are so small, they are also **fragile and susceptible** to **fluctuations in heat or cold**. They need **shrubs and bushes (or an insect house) for protection** and also **water** – a bird bath is sufficient.

# Living Creatures - Survival Needs

This the key is to remember that all living creatures need

1.Food for adults and their larvae which may differ during the life cycle

2. Water

3. Shelter

4. A safe place to reproduce and rear their young

## Starting with food

Many **adult insects require pollen and nectar**.

I have already explained that there has been a **staggering decline** in the number of pollinating insects.

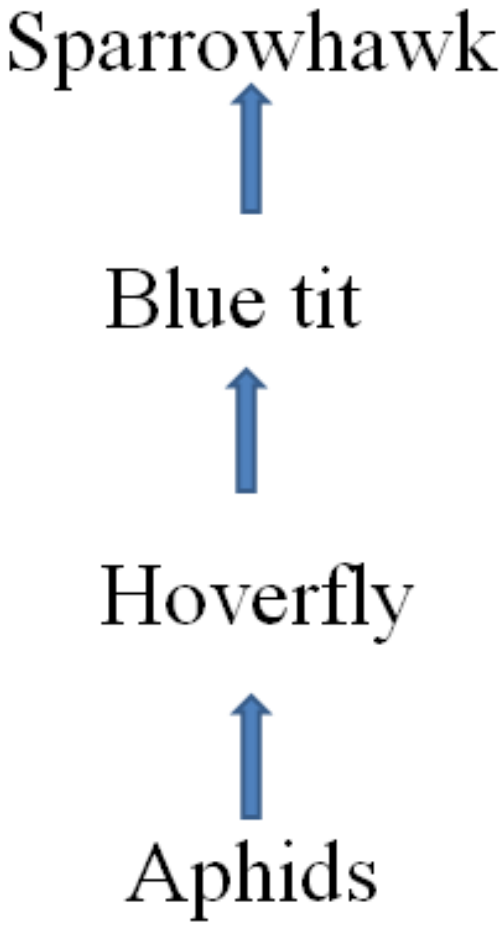
Most people will think of **bees** as the principal pollinating species, but equally important are other insects such as **moths, butterflies, beetles, lacewings and hoverflies.**

The **crucial thing** is to think about the **life cycle of an insect**. The **needs of the larval form** are quite different to those of the adult.

**Lacewings, hoverflies and ladybird larvae** feed on aphids which in turn suck plant sap. A single lacewing larva will eat 200 aphids in a week!

# From Aphid to Sparrowhawk

If there are no **aphids**, no food for the **larvae** of these insects and then no adult **hoverflies** and no food for **blue tits** which in turn are food for **sparrow hawks.**



# Food for Larvae

**To avoid the extinction of moths and butterflies & other insects, we must also provide plants upon which their larvae depend.**

Often, we only think of the adult insect – we delight in seeing a **comma butterfly or elephant hawk moth**, but the **eggs** of the peacock, red admiral, tortoiseshell and comma butterflies are laid on **nettles, growing in the sun.**

When we lived in Yorkshire, and owned a large garden, we were asked one year to join an Open Gardens afternoon in aid of the local church. We were happy to do this, but as the day drew near, doubts surfaced – the other gardens we knew were beautiful with lots of interesting plants, ours was a family garden with nothing rare or unusual. We then decide to make a "Wildlife Trail" round the garden highlighting wood piles, bird boxes, ponds etc. with the final stop at the Tea Tent. Our first visitor introduced himself as a professional gardener. My heart sank, what could he possibly find of interest? We handed him the Trail Sheet and off he went. After a while he returned and said what an eye opener it had been – for instance, he knew Buddleia attracted butterflies, but he didn't know that so many needed nettles on which to lay their eggs.

# Life Cycle of Insects

It is essential to think of the life cycle of insects. The flowers of Buddleia, introduced by the Victorians from China, attract butterflies, but their leaves are unused by the majority of **moths, leaf miners, aphids and flies.**

Elephant Hawk moth caterpillars eat the leaves of rosebay willow herb – which is widely considered a weed and pulled out. Fortunately, they also eat the leaves of Fuchsia.

# Flower Shapes attract

Adult pollinating insects require **different shapes of flower.**

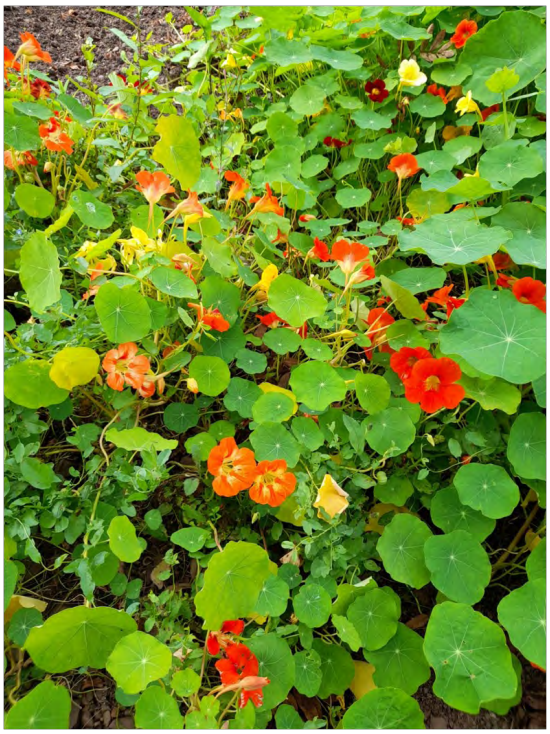
Some are attracted by a flat flower such as **Inula or cosmos**, others with long tongues prefer tubular flower heads like **foxgloves or snapdragons**.

***Watch pollinating insects alighting on a flower and how they extract the nectar and pollen.***

Flowers to **avoid growing are "double petalled"**. They are bred for **colour and visual impact** at the expense of producing nectar. They are of no use to insects.

# Imaginative Planting

Be imaginative with your planting – a row of cabbages is Christmas for white butterflies – an endless supply of leaves for their eggs.  Dot your plants around – this is called **polyculture and will reduce the predation**.



White butterflies also lay their eggs on **nasturtiums**, so if you plant these close to your brassicas, they can become **sacrificial** plants, attracting the white butterflies and saving your cabbage and broccoli.

# Companion Plant

Another idea is to **“companion Plant”** for instance, marigolds between lines of vegetables.

The **marigolds provide nectar, which attracts the hoverflies whose larvae we already know, will eat the** aphids.

The strong scent of marigolds also deters unwanted insects.

# Number 1 Enemy—the Slug

Number 1 enemy of most gardeners is probably the **slug**. They come in various shapes and sizes and do a grand job of **breaking down dead and decaying matter**, but sadly are also partial to those delicate seedlings.

My top tip is to use a beer or wine trap. You can buy fancy ones from Garden Centres, but a used margarine or humus container works just as well. And you know the slugs had a happy death! Move the containers **around the garden** and you will be astonished at how many slugs you catch in one night. The other obvious things to do is **look for** the plants or stones or pots under which they are **hiding** during the day and pick them out by hand.


# Integrated Pest Management

Try to **develop an integrated pest management** scheme in your garden and avoid using chemicals which are **indiscriminate and destroy key elements in the food chain**.


Do learn to tolerate some damage.

# Shelter

Many animals, both **large and small require holes and crevices** in which to **hibernate, rest and raise their young**.

Most gardens are short of natural holes and immature trees have not developed the nooks and crannies of old specimens.

Hedges or shrubs and climbers over fences and walls are helpful in providing shelter and cover for animals of all sizes.

# Bug Hotels

**Bug hotels** can also **compensate for the lack of natural holes** and **crevices**. They are occupied by **ladybirds, lacewings, wood lice, beetles, slugs, frogs, toads and small mammals such as wood mice and shrews.**

It is easy to make a simple lacewing hotel which can hang in your garden for over-wintering of these useful insects. Cut the bottom out of a lemonade bottle, roll some corrugated paper inside and fix a wire or string handle near the top.

Lacewings are attracted by light, so try placing it near a window. It should be in place by the middle of August, as this is when the adults start to look for shelter.

I would urge you not to be too tidy in the autumn and winter. Different stages in the life cycle of insects – eggs, larvae, pupae and adults spend the winter in leaves, on twigs and the general litter in our gardens. I shook out some Nigella seed heads in November to collect the seeds and was surprised at the number of invertebrates which crawled out.

# Bees

I will now talk about bees, as there is much publicity highlighting the decline in their numbers.

There are 250 species of bee in Britain, just one, the honey bee, lives in large communal colonies, usually a hive.  There are also about 25 species of bumble bee which either nest in old mouse holes in the ground, under sheds or some above ground in long grass. They are also opportunists, and will use a ventilation grating to gain access to a dry space for a nest.

Apart from the honey bee, all other bees are solitary with no queen, workers or drones.  This is where **bee houses** come into play.

Many solitary bees choose to nest in **holes in wood made by wood-boring insects or old plant stems, but these are in short supply**. A bee hotel placed **south facing**, is a great way to encourage solitary bees and other insects. This is how it works. When a female bee has mated, she chooses a bamboo stem in the bee hotel and at the far end makes a nest chamber of leaves, flower petals or mud, depending on the species. She then gathers pollen and nectar and makes a cake which is placed within this chamber and an egg on top. The chamber is then sealed with more leaves, petals or mud and then she makes a second chamber, lays another egg, seals it up and gradually works her way along the cane until it is filled with individual little egg chambers. The **eggs laid in spring and summer** hatch into grubs which eat the cake of pollen and nectar, then

in late summer pupate, ready to emerge as adults the following spring. It is a good idea to take down your bee hotel in winter and store it somewhere cool and dry. Woodpeckers and tits can raid the bee hotels in winter and fungal disease can kill the occupants.

# Bird Boxes

Bird boxes can be made to attract different species. The most popular being blue or great tit nest boxes. Provided they face **north to north-east** (away from strong sunlight and the prevailing wind) are out of reach of cats and have a clear flight path in are excellent ways to help garden birds. Many people think of these bird boxes being used only in spring and summer for raising young, but in the winter, many birds **roost** during the night in bird boxes, when several will cram together in one box **to keep warm.**

**Sparrows and swifts** like to nest communally, so several boxes together will attract them,

and then there are more specialist boxes, such as this tawny owl box which, year after year, proved very popular in our Yorkshire Garden.

# Bats

**Bats** are suffering not only from the **loss of their insect food,** but also from lack of suitable places to breed, roost and hibernate.  Bats fly at dusk and dawn to feed and will rest up between these feeding bouts.  Bat boxes, grouped together high up in trees can provide these rest stops.

Studies in Wytham Woods show that bats roost in the tit boxes, once the birds have finished nesting.

It enables researchers to check on species, and count numbers of males, females and juvenile bats.

# Compost Heaps

Compost heaps are incredibly important for gardens. They are home not only to multitude of invertebrates including woodlice, worms, also fungi and bacteria which break down the vegetation, but also attract slow worms, which are legless lizards and grass snakes. And, of course, you produce excellent humus for your garden which will increase the water retention of the soil and act as a fertiliser.

# Choosing the right compost

It is tricky to produce the right compost for some seeds or potting-on young plants, so most people head for the Garden Centre, where they can buy a range of suitable products.

**However, any containing peat must be avoided.**


# Peatlands

Peatlands are the UK's largest store of carbon, equivalent **to 8 years of total UK carbon emissions**. It is critical to preserve them. On a global scale, they occupy **3% of land area**, but **contain 25% of global soil carbon - twice as much as all the world's forests.**

I am finishing with compost because without a healthy soil we can't grow healthy plants. Without healthy plants we won't have a diverse insect population and without insects our gardens will not be sustainable and the whole edifice of the ecosystem will crumble.

# A Final Word...

A final word from the US biologist Paul Ehrlich. He likens the loss of species from an ecological community to randomly popping out rivets from an aeroplane wing..

Remove one or two and the plane will probably be fine. Remove ten, twenty or fifty and at some point, that we cannot predict, there will be catastrophic failure. Insects are the rivets which keep the ecosystem functioning.