I'd like to start my talk this evening with a couple of quotes about water in our gardens. The first is from plant collector and gardening writer and illustrator Reginald Farrer, in his 1908 book *Alpines and Bog Plants* :

"Advice to those about to build a Water-garden - DON'T."
Water, like fire, is a good servant, but is painfully liable to develop into a master."

Somewhat discouraging cautionary note! Perhaps reflects the idea that creating and looking after ponds or other water features in our gardens can be a labour-intensive and time-consuming business... Which, as gardeners, we probably want to avoid!

But Reginald Farrer was a Yorkshireman, probably given to forthright speaking (and I can say this because my mum is Yorkshire born and bred). He was also something of an eccentric, famously planting a rock garden in Clapham by the method of loading a shotgun with seeds and firing it into a rocky cliff.

To offer a counter-view, here's another quote from garden designer (and secretary to King Louis XV) Antoine-Joseph Dezallier d'Argenville, from his 1711 gardening best-seller, *Theory and Practice of Gardening* :

"How often it is that a garden, beautiful though it be, will seem sad and dreary and lacking in one of its most gracious features, if it has no water."

It's true that people are drawn to water: from our earliest years, we get pleasure and well-being simply from being around it. Recent studies by the European Centre for the Environment and Human Health have shown a strong correlation between the presence of water in a landscape (whether that be the sea, rivers, ponds or urban water features) and positive effects on well-being (so-called 'blue health').

Since ancient times, the inclusion of water and water features in gardens has been a common practice, such as in Roman gardens with their complex systems of irrigation and aqueducts, and Persian 'paradise' gardens with their emphasis on water in combination with light and shade (the Fin Garden at Kashan, Iran – the oldest garden in Iran, dating from 1590). Persian gardens were designed as places for relaxation, meeting with friends, and spiritual contemplation. These traditions of making water features central to garden design persisted through the centuries, also used in Italian Renaissance gardens copied throughout Europe, inspired by classical ideals of order and beauty: such as the 16th century water garden at the Villa d'Este near Rome, with its 'Hundred Fountains' and water organ… A style still popular in many Mediterranean-style gardens today.

From the inclusion of water in gardens as part of symbolic, decorative or practical features, from the late 18th century water came to be used in gardens more naturalistically: in ponds and lakes which were integrated into the landscape, often with increasing amounts of planting to soften edges and water feature surfaces. A good example of this is the landscape at Compton Verney in Warwickshire, designed by Lancelot 'Capability' Brown.
Does anyone recognise the garden which this photograph shows? (Monet's garden in Giverny, northern France.) Inspired by the Japanese prints that he and his fellow Impressionist painters were seeing in the mid-nineteenth century. ['Summer View' by Utagawa Yoshitora, 1868]

Of course, most of us don't have the space or funds to create the kind of grand scale water gardens that we might visit in this country and abroad... But there's no reason why we can't think about including water as a design element in our gardens at home – however small.

So what is a garden water feature?
The answer is: anything you want it to be!

It can be still water of any description: ponds for wildlife, fish or reflections.
It can be moving water: a fountain, a stream, a cascade.
It can be a sculpture, a work of art; a wildlife habitat.
It can even be a feature where water itself is not immediately visible, such as in a bog garden.

We can start by taking a look at the water feature that is my particular favourite: **ponds.**

First, let's debunk a few myths about ponds:

1) Ponds are difficult to create and look after – MYTH. Ponds can be simply designed and usually require minimal management, if a little initial thought is put in at the design stage.

2) Ponds constantly need topping up with water in dry weather – MYTH. Water levels in natural ponds in the wild fluctuate constantly, without causing problems. Our native pond life has evolved to cope with this. And topping up ponds with a hose in dry weather is counter-productive – tap water is actually high in nutrients, and can cause algal blooms.

3) Ponds have to be at least a metre deep for fish and wildlife to survive – MYTH. A pond only needs to be 30cm deep in the middle; and shallow ponds are better for wildlife (water – more oxygenated, and also easier for animals such as hedgehogs or pets to get out if they fall in).

4) Having a pond in your garden means you'll have plagues of mosquitoes – MYTH. If you have fish in your pond they will eat the mosquito larvae; so will frogs, toads, dragonflies and all kinds of other pond wildlife. Also birds and bats will do the job!

5) If you've got trees in your garden, you can't have a pond – MYTH. If fallen leaves accumulate in your pond you can scoop them out with a net in autumn (don't cover your pond with netting, as wildlife such as birds and hedgehogs can get tangled in this and die). Shade from trees will actually help to prevent algal blooms.

So how should a pond look? Well, however you want. Ponds can be naturalistic for wildlife; formal, to blend in with hard landscaping; they can be small enough to fit in containers on a patio or balcony; or they can be the size of an Olympic swimming pool (such as this wildlife pond I helped to construct for toads at a site near Henley).

Whatever a pond's size or style, ideally it should follow the same two basic ecological principles:
- Having a waterproof liner or substrate which retains water.
- Having 'zones' of varying depths within the pond, which will suit different types of aquatic and marsh plants. If you wish to create the most diversity and interest, try to design a pond where as many zones as possible are present.

So, assuming that your garden soil is not heavy clay that retains water on its own, what materials can we use for lining a pond?

- Concrete (expensive, labour-intensive, needs expensive sealants, prone to cracking/ leaks).
- Preformed plastic liner (off-the-peg design with planting ledges; not usually the best shapes or depths for wildlife).
- PVC plastic (cheap, flexible; needs underlay, not as durable as other liners, becomes brittle and cracks under 8ºC or in sunlight).

- Butyl rubber or EPDM (flexible, stronger and more durable than PVC; needs underlay). Tends to be the liner most pond designers use.

Step-by-step guide to creating your pond:

1) Choose a good spot; mark out pond outline with rope, hose pipe, spray paint or sand.
2) Carefully remove turf from within outline, keeping some turf for re-using later to cover pond liner edges. Compost the rest or use elsewhere in your garden.
3) Dig out your pond hole. For big ponds, consider inviting friends and family to help you or even hire a small mechanical digger. As you dig, check the depth of your hole: aim for your pond to have shallow edges. Check that the top edges of your hole are level.
4) Once your pond hole is dug, pick over it to remove stones, tree roots or anything that could damage your pond liner. Then line the hole with something to protect the liner: a layer of sand or old newspapers, followed by a pond underlay.
5) To calculate what size pond liner you will need:
   LENGTH = length + (2 x depth) + 30cm; WIDTH = width + (2 x depth) + 30cm.
   Place pond liner in hole, allowing generous overlap. (A second layer of pond underlay can be used over the liner if desired.) Weigh down edges of liner loosely while pond is filling with water. Ideally fill your pond with rainwater (collected and stored over previous months): remember tap water his high in nutrients and can promote algal blooms.
6) Once your pond is full of water, replace turf around its edges (or cover them with other materials such as shingle, gravel or paving slabs). Plant up your pond with a range of plants, including oxygenators (submerged pond weeds). These will provide food and shelter for pond animals and wildlife, as well as softening your pond's edges. Try to choose native British plant species wherever possible.

If you decide to include non-native plant species, there are definitely a few you should avoid: I call them **Wetland Thugs**. The 7 plants pictured here are highly invasive, difficult to eradicate once introduced, and are causing expensive problems in our wider countryside where they have escaped into watercourses and wetland habitats. For most of the 7, trade in them is now prohibited but some aquatic plant suppliers still seem to have them in stock – not to mention gardening friends who may generously donate you some of their own!

General rule of thumb when choosing plants: buy native British species whenever possible, avoid these 7 highly invasive species, and if disposing of pond plants please compost them – never get rid of them in nearby ponds or watercourses.

This picture from *BBC Wildlife magazine* gives you some idea of the range of native British plants suitable for planting in garden ponds, from submerged oxygenating weeds and floating plants such as water lilies, to marginals and plants of waterside meadows and damp soils. Using native species makes sense because these are plants that have evolved to suit UK climate and soils: they are also likely to be more beneficial to wild insects, birds and animals.

Native UK wetland plant species are very attractive. Marsh marigold, Water mint, Brooklime, Yellow flag iris and Water Figwort are all marginal plants that will grow well with their roots in wet soil; while Comfrey, Angelica, Lady's-smock (Cuckoo flower) and Snake's-head fritillary are attractive plants of waterside meadows. Also three native species of water lily: the White water-lily, *Nymphaea alba*, Yellow water-lily *Nuphar lutea* and Fringed water-lily *Nymphoides peltata*.

For a pond to be healthy, a good range of plants is an important factor. Leave at least 4 weeks between planting and introducing fish... And if you want your pond to be good for wildlife, don't have fish: they are top predators and will predate on other animals.

There is no need to introduce wild animals to your pond: if the pond is suitable for wildlife, it will arrive! I often get asked by people how they can introduce wildlife such as frogs, toads or newts: the answer is, by providing a good pond with plenty of vegetation, but also by having other features in their garden that these animals require: compost heaps, log piles, areas of tall grass, dense planting etc. It also helps if your garden is not completely surrounded by an impenetrable fence or wall – these animals need a way in!

As gardeners we should welcome amphibians such as frogs, toads and newts to our gardens: they are valuable pest controllers (so do also avoid using slug pellets). Some garden ponds may even provide refuges for shy and completely harmless Grass snake – another gardener's friend, as it eats mice and other small mammals that may damage our valuable flower bulbs and veg crops!

Insects such as dragonflies (Common Darter, Broad-bodied Chaser) and damselflies (Common Blue, Large Red) will also be attracted to ponds and eat up your mosquitoes; as will a whole range of beneficial insects including beetles, hoverflies (which will eat aphids), butterflies like this Orange Tip (pollinators) and moths such as Scarlet Tiger (also pollinators).

Once your pond is created, there are some minimal management tasks you will need to do to keep it in a healthy state:

- Annual thinning of oxygenating pond weed and plants (done in early autumn). Best to aim to remove about 25% of the plants in one year. Rinse the plants in a bucket of water to remove any pond creatures, and compost them. NB I suggest you use a more substantial platform to access your pond than the gentleman in the top left-hand photograph!
- Removal of dead leaves. Easily done with a net, throughout autumn and early winter. Avoid placing netting over your pond to catch leaves, as wildlife may get caught in it and die.
- Controlling duckweed, blanket weed and other algae. Duckweed is best removed using a net; blanket weed by twisting it round a garden cane and pulling it out. Algal blooms are a sign of pond water that is too nutrient rich, which can be exacerbated by tap water, fish, ducks and sometimes sunlight. Adding a loose bundle of barley straw to your pond can prevent algal bloom if you think it is likely to be a problem: the straw needs to be added several weeks or even months before blooms occur in the summer, and kept near the water surface.

Another type of garden water feature is a bog garden. Bog gardens can be a good option where having a pond would raise safety issues, e.g. in a garden that is used by young children – or if you have a pond that has developed a leaky liner!

Bog gardens need permanently moist soil: like ponds they will need a liner to maintain damp conditions – but perforated with a few small holes so that bog plants are not 'swimming' in water. Planting can be naturalistic in character, or use more bold colours and structural plants.

Some tips for creating bog gardens are:

- Aim for soil that is permanently damp, but not with standing pools of water. Puncture your bog garden liner a few times with a garden fork to allow sufficient drainage.
- Bog garden plants prefer soils high in organic matter. Incorporate compost or leaf mould into soil before filling your bog garden hole.
- Many bog plants have evolved in soils very low in nutrients, so will not need feeding.
- Some bog plants prefer acidic conditions, so water your bog garden with rainwater if possible.
- The best time to plant up your bog garden is in the spring.

Native British plants good for bog gardens include: Ragged Robin, Pendulous sedge, Creeping Jenny, ferns such as Hart's-tongue fern, Purple loosestrife, Devil's-bit scabious, Yellow flag iris, Sneezewort, Greater willowherb and any of the marginal pond plants mentioned earlier.

Garden flowers for moist bog garden soils include: *Ligularia dentata* 'Desdemona', Water avens *Geum rivale*, Japanese primrose *Primula japonica*, Crocosmia (Montbretia), Chinese astilbe *Astilbe chinensis*, ornamental ferns, Chinese rhubarb *Rheum palmatum*, Hostas and Hydrangeas.

Real bog garden enthusiasts may wish to try growing specialist plants which have evolved in the wild to tolerate the nutrient-poor soils found in bog and marsh habitats. They partly do this by trapping and consuming insect prey: such insectivorous plants include Sarracenias (so-called 'pitcher plants'); and also our native Butterwort *Pinguicula* and Sundews *Drosera*. Such plants would certainly be a talking point in your garden!

For the concluding part of my talk, I'd like to touch on the topic of water-wise gardening, within a wider context of how we manage water within our modern society and landscape. I'd like to invite you to try a short quiz about water in the UK!

1) How many litres of water does a person in the UK use every day, on average?
   (a) 20 litres (b) 70 litres (c) 120 litres (d) 160 litres
   It is in fact **160 litres daily per person**, and this amount is rising by 1% each year. If we include 'embedded water' (water used in manufacturing the goods we buy and the services we use) in our daily consumption, that figure rises to a staggering 3400 litres per day. With a UK population of 69 million, that's the equivalent of each one of us draining 65 Olympic-size swimming pools every minute!

2) Enough rain falls in the UK to more than meet the needs of every person here.
   True or False?
   It's true. The roof of an average-sized house could collect 85,000 litres of water of rainwater per year, which could be stored for use in the garden and home.

3) Which of the following predictions about climate change is true:
   Climate change means that here in the UK we will have more...
   (a) Warm weather and droughts
   (b) Wet weather and flooding
   (c) Windy weather and storms
   The answer is: **all of the above**! Climate change means that globally weather systems are becoming more violent and unpredictable, which means more extremes of all kinds of weather.

4) By 2050 in the UK, how much per year will severe weather such as storms, flooding and droughts caused by climate change cost us?
   (a) £500 million per year (b) £3 billion per year (c) £20 billion per year
   It's a shocking **£20 billion**, including increased flooding, heat-related health conditions, impacts on agriculture and food supply problems, and damage to transport, water and energy infrastructure… Plus subsequent costs such as insurance claims and repairing and improving flood defences.

There is now a term for our climate and weather changes: it's known as **Global Weirding**. Put simply, it means that extreme weather has now become the norm... And this is likely to continue and worsen.

In the UK, climate change means more flooding AND more droughts… As this Met Office graphic from 2020 'State of the UK Climate' report shows. Extreme heavy rainfall events and flooding happen more often than did a decade ago. Droughts and heatwaves are also occurring more frequently in the UK as a result of climate change – even here in Devon, where we're used to damper weather. These droughts are severely impacting farmers and gardeners alike.

This situation affects all of us: and it's why millions of ordinary people are planting trees and gardening for wildlife, as well as demonstrating in our towns and cities. And the IPCC (International Panel for Climate Change) stated in 2019 that the science shows that not only is climate change occurring, but it's speeding up quicker than we predicted: with huge effects on agriculture and food production happening already and starting to worsen.

So that's the bad news... But as gardeners, can we really make any difference?

Yes, absolutely!

- Up to 70% of our water usage in dry weather is what we use in our gardens... And covering garden soils with paving slabs or decking is increasing flooding in all areas of the UK. To help we can:

- Adapt our gardens to cope with both heavy rainfall and drought, reducing flooding and water shortages.

- Make our own compost instead buying peat-based composts, helping preserve natural wetland habitats such as peat bogs which absorb rain and floodwater.

- Plant trees and shrubs in our gardens which help to store water in their foliage and roots, and stabilise soil erosion.

- Create ponds, bog gardens and rain gardens in our gardens to conserve native wild plants and animals, and help reduce flooding.

Some different water-wise gardening methods:

- Create our own compost from garden and kitchen waste. This not only means we're not buying peat-based composts which deplete natural wetland habitats that should be acting as our 'sponges' for flooding, but also soils which have plenty of organic matter added to them in the form of compost are better at retaining water so less watering is needed. Organic matter in soil can absorb up to 20 times its own weight in water.
- Use smart watering practices: Water plants at cooler times of day such as mornings and evenings to reduce water loss by evaporation.
- Use bottle reservoirs to direct water to where it's needed: the plant's roots. 'Water the soil, not the plant' is a good rule of thumb.
- Use drip-feed irrigation, e.g. an old hosepipe with holes pricked along its length placed or buried amongst plants.
- Combine smart watering with barriers and mulches to keep soils moist: at Five A Day Market Garden community gardening project we use Mypex membrane on all our beds,

planting through holes cut into it. We even use it in our poly tunnels. Such membranes can be further improved by adding a thick layer of mulch such as bark chipping on top, as we do in our fruit growing areas. The added bonus is it cuts down hugely on weeding!

- Harvest and store rain water for use in the garden – most rainfall occurs in the winter, so we need to store water for drier and warmer periods. (Grey water from the home can also be stored and used.)

We can also plant trees and shrubs in our gardens. Recent research has shown that trees planted in rural areas – especially along water catchment areas and river valleys – can significantly reduce flooding in urban areas downstream. Devon farmer Andy Gray is one landowner who is taking part in an agroforestry (silvopasture) trial organised by Rothamsted Research and the Organic Research Centre, the Farming and Wildlife Advisory Group, the Woodland Trust and Innovative Farmers, and the Soil Association. I helped out by planting some of the tree saplings in February 2020!

Trees help to reduce flooding wherever they are grown, through mechanisms shown on this image of the water cycle. And trees grown in urban areas – cities, towns, villages, in our gardens – are just as important for slowing down and reducing the heavy rainfall and flooding we're now experiencing. Even a small tree will make a difference: or you can grow trees such as willow or hazel which can be coppiced every few years to keep them small.

Another development in water-wise gardening so-called rain gardens. As our gardens and neighbourhoods become increasingly covered with hard landscaping, this has made us increasingly vulnerable to flooding from the heavy rain storms that are a growing feature of our weather.

Rain gardens are SuDS - Sustainable Drainage Solutions - designed with issues such as drought and flooding in mind, combining free-draining substrates with planting that can tolerate inundation or drought. They are both practical and attractive, as well as significantly contributing towards better and safer management of water in our surroundings. This photograph shows Hugo Bugg's Gold Medal-winning RBC Waterscape Garden at Chelsea Flower Show in 2014.

The growing awareness of issues such as the impacts of climate change on our weather, and of the importance of finding more sustainable ways of managing our environment and our water use, is a positive trend. It will mean that as gardeners we will have to learn different ways of doing some things – and luckily there is a wealth of reference material out there to assist with this, from books on water-wise gardening to websites with helpful tips about water use.

Remember you can also enlist the help of the younger generation in your water-wise gardening, especially if you've got a pond or bog garden (children love these). By growing our own fruit, vegetables and flowers and sharing our produce with friends and neighbours locally we save water that would have been used in agriculture. And if by passing on our skills to the next generation as well, we stand a good chance of making our communities and our country more resilient to climate change... As well as having wonderful green gardens to enjoy.

I find the presence of water in a garden a joy. There are few things I enjoy more than sitting beside a pond watching dragonflies dart about like luminous jewels: or listening to the trickle of a cool fountain on a hot summer's day. I hope that with my talk this evening I've inspired some of you to find space for water in your gardens: and also to perhaps choose some ways in which you can garden in a more water-wise fashion.

I'd like to finish my slideshow with a photo of my great-niece Rowan, enjoying spending a sunny summer's afternoon peacefully playing with a fountain in my parents' garden in Buckinghamshire...

...And leave you with a quote from garden designer Sir George Sitwell:

"The magic of water: an element which owing to its changefulness of form and mood and colour and to the vast range of its effects is ever the principal source of landscape beauty,
and has like music a mysterious influence over the mind."

Becca Flintham
May 2022