



Troubled water

Ian Holman and Jerry Knox review the ground covered in the 2021 John McLeod Lecture with their thoughts on water resilience for plants, people and the planet



DAVID HICKES / ALAMY

The River Wharfe in Yorkshire (left) was running alarmingly low by early May 2017.

Howden Reservoir (above) in the Derbyshire Peak District was seriously depleted in June 2018.

KEITH SKINGLE / ALAMY

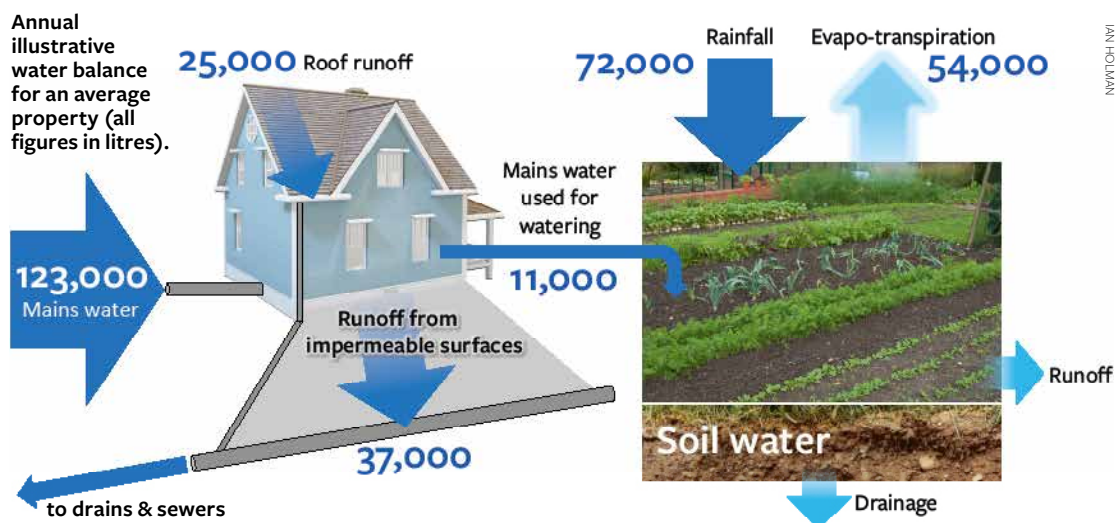


WATER FORMS THE basis of one of the Net Positive for Nature targets within the recent RHS Sustainability Strategy. However, while many gardeners may be aware of the water challenges that faced Cape Town in South Africa as it approached 'Day Zero' in 2018 or the 2001–2009 Millennium Drought in Australia, why do the RHS and the UK's 30 million gardeners need to worry about garden water use?

Before considering that, first we should consider a cubic metre of water. What is it? At its simplest it is 1,000 litres of water, but it is also:

- 💧 the volume of rainfall that falls on every 1.5m² at RHS Garden Wisley in a typical year
- 💧 the average total weekly water use per person in the UK
- 💧 the amount of irrigation water used to produce about 520 portions of high-quality UK potatoes
- 💧 associated with greenhouse gas emissions, equivalent to driving a car for up to 1 mile (due to the energy used in drinking water treatment and pumping)
- 💧 about £1.60-worth of mains water supply
- 💧 the amount of water used running a hosepipe in the garden for one hour

Put in these terms it becomes obvious using mains water in our gardens, allotments and outdoor spaces can account for substantial volumes of water, particularly during the summer and dry periods when water availability in rivers, aquifers and reservoirs tends to be at its lowest. Its potential as a contributor to stresses on the water supply system and the environment is clear. The »



Environment Agency, which regulates water resources in England, has identified that there is an increasing risk of future water shortages due to the effects of climate change and increasing population. Its National Framework for Water Resources, which was published in 2021, states that if no action is taken by 2050 an extra 3,400 million litres of water will be needed for public water supply each day. How this will be achieved will differ across the country but is likely to have four strands: reducing leakage from the water distribution system; investing in infrastructure such as new reservoirs; adopting drought measures; and improving water efficiency in businesses and our homes.

Given that Artesia Consulting has identified that the large increase in domestic water use in the UK drought of summer 2018 (20% in metered households and 30% in unmetered households) was 'largely due to outdoor use', it is hardly surprising that anticipated drought measures and water efficiencies include Temporary Use Bans ('hosepipe bans') and water metering intended to target garden water use.

Making better use of rainwater

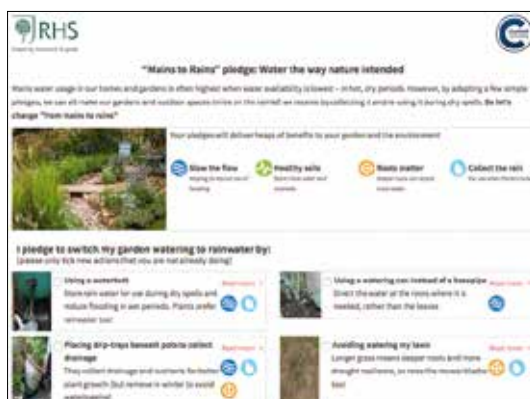
The challenge for gardeners is that garden water demand is greatest when water availability is lowest due to the seasonality of the high temperatures and sunshine that drive evapotranspiration, making better use of the rainfall we receive is the low-hanging fruit. Unlike many countries, rainfall in the UK lacks any strong seasonality with similar rainfall totals in each season in most areas. As gardeners, we need to make best use of the 'free' rainfall we receive.

Figure 1 shows an illustrative annual water balance for an average garden, using climate data from RHS Garden Wisley. Most of the 72,000 litres

of rainfall falling on the garden returns to the atmosphere by evaporation from soil and plant surfaces and by transpiration from leaves, with the remainder leaving as runoff or drainage. During years of low rainfall, around 10,000 litres of mains (drinking) water may be used to water containers, plants, glasshouses and lawns. Consequently, the garden water cycle often relies on water abstracted from some distant aquifer, river or reservoir, treated and pumped using carbon-emitting energy.

However, the figure also shows that far more rainwater is available than is required to meet garden water demands, with around 25,000 litres of rainwater running off the house roof and 37,000 litres from other impermeable surfaces.

Unfortunately, in many houses this runoff goes straight into the drains and sewers, contributing to downstream flood risk and the overwhelming of the sewerage system during storms. We should be trying to achieve a situation where the limits of the garden water cycle are the limits of the property. This can be achieved through reducing soil



Take the 'Mains to Rains' pledge at <https://mains2rains.uk>

evaporation, improving soil health so that it can store more water, reducing summer drainage losses and capturing and using more runoff.

Gardeners can start to make this transition by taking the 'Mains to Rains' pledge, developed by Cranfield University and the RHS, at mains2rains.uk. Each pledge represents a simple action to reduce mains water use and increase water resilience. The pledges are to:

- 💧 **Avoid lawn watering:** lawns turning brown during drought is a natural response from which they will recover.
- 💧 **Use a watering can rather than a hose:** this ensures water is directed where it is needed (the roots) and reduces soil evaporation.
- 💧 **Add mulch around new plants:** mulches let through rainwater and reduce runoff but limit soil evaporation.
- 💧 **Add organic matter to soils:** this increases the water-holding capacity of the soil.
- 💧 **Put drip trays under pots and containers in summer:** drainage losses from watering can then be captured.
- 💧 **Use self-watering pots, containers and hanging baskets:** these contain a water reservoir from which the plants can draw moisture.
- 💧 **Install and use a water butt.**
- 💧 **Swap paving for plants:** removing some paving allows runoff to infiltrate the soil.
- 💧 **Choose permeable paving:** there are plenty of alternatives, from grass reinforcement mesh to resin-bound gravel.

These small actions can scale up to large benefits. Already, over one thousand gardeners have made the 'mains to rains' pledge, with their combined pledges saving up to 11 million litres of water in a typical year.

Collective effort

However, we shouldn't think that this is all the responsibility of gardeners. Government, planners, developers and the horticultural and landscape industry all have roles to play in improving garden water management. Permeable paving, soakaways and runoff attenuation systems (like the permavoid system installed beneath the Learning Garden at RHS Hilltop that captures roof runoff and uses some of it to sub-irrigate the Garden) should all be encouraged in new developments. They may be more expensive in the short-term, but we shouldn't forget that there are significant costs and damages associated with flooding and sewer overflows in

wet periods and water restrictions during drought.

Every time we purchase a plant from a nursery, garden centre or supermarket, water has been used to grow that plant from a seed or cutting. While the horticulture sector is a small overall user of water – using just 0.2% of total annual UK water use according to the Horticultural Trade Association – its use is highly seasonal and often of mains water. Businesses can become highly water efficient by investing in monitoring, staff training, irrigation management and rainwater and runoff harvesting. However, given the low price of water, implementing such measures can increase their costs. Water-efficient businesses should actively promote their efforts to customers and gardeners should, where possible, support them in return.

However, if an efficiently grown plant is then purchased for planting in an unsuitable environment, it is likely to die or require additional watering. There are great tools to advise gardeners on the right plant for the right place, such as the RHS's 'Find a plant' webtool, but too often garden centres focus on the 'plant' and not the 'place'. Laying out stock according to its needs will help customers achieve growing success.

The UK has highly efficient fresh produce supply chains that ensure we have plentiful supplies of fruit, vegetables and cut flowers throughout the year. Growing the fresh fruit and vegetables (excluding potatoes) eaten in the UK requires the use of about 500 million m³/year of freshwater, of which only 13% is in the UK. Much of the remainder comes from water-scarce countries such as Spain, South Africa, Egypt, Chile, Peru and Israel. Although the UK cannot meet all of its fresh fruit and vegetable requirements due to our climate, using rainwater to grow fruit, vegetables and flowers at home, in our gardens, balconies and allotments, instead of purchasing overseas produce will help to reduce international water scarcity, while saving food-miles, energy consumption and greenhouse gas emissions.

We are facing a climate emergency and a biodiversity crisis. Bringing improved water management into gardens and outdoor spaces will benefit plants, people and the planet and help demonstrate that gardeners and gardens are an important part of the solution to the growing problems of water scarcity and flooding. ○

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