

# Water supplies

**SUMMARY** Water is essential for plant growth. It is a limited and valuable natural resource, which may become scarce during periods of low rainfall.

The Royal Horticultural Society urges gardeners to make economical use of water by understanding the needs of plants and taking steps to reduce its loss from plants and the soil.



Water – an essential requirement and valuable resource

## RHS policy statements

- 1 The Royal Horticultural Society actively supports initiatives for the conservation of water and the protection of supplies from pollution.
- 2 The RHS promotes through its gardens and advisory services knowledge of the principles of water requirements in plants, and the means by which irrigation in gardens can be kept to a minimum with necessary applications economically made.
- 3 The RHS recommends the importance of thorough and timely watering, and accurate placement to reduce wastage.
- 4 The RHS recommends that gardeners should collect rain water and use suitable waste domestic water, as a means of supplementing essential irrigation requirements.
- 5 The RHS demonstrates and advises on the most economical methods of water application and use.
- 6 The RHS, through its advisory services and in its own gardens, promotes a responsible attitude concerning the use of garden chemicals and the disposal of surplus sprays that might pollute watercourses.

# Water supplies

## Water supplies

Plants need most water during hot dry weather when water companies are least able to meet the demand and may ban hosepipes and sprinklers. Garden water use is estimated at less than three percent of the annual water consumption of an average household. At peak times, however, as much as 70 percent of water supplied is used in gardens. Peak demand occurs during summer evenings after two weeks without rain. This surge in demand can lead to water companies being forced to deplete groundwater and rivers, which can harm wildlife that depends on streams, rivers and springs.

The cost of infrastructure to meet peak demand is borne by all water users. In the wider interests of the environment, and for the use of water in gardens to be acceptable to other water users, gardeners should be as sparing as possible with mains water.

## Water storage

Rainwater from roofs can be stored in tubs and other containers. Even in dry districts, 24,000 litres of water (enough to fill 150 water butts) could be collected from the roof of a small house each year. However, most rain falls in winter, and to store this for summer use would use up much garden space or be very expensive. Climate change models suggest an increasing proportion of rain will fall in winter so it may become cost effective to incorporate water storage when constructing new dwellings.

A 200 sq m garden loses by evaporation about 4,820 litres, or the contents of 30 ordinary water butts, every ten days in dry weather. From May until September, for about 18 weeks, plant needs usually exceed

rainfall. At first the shortfall is met from soil reserves but these may peter out by July, leading to about six weeks when watering is needed, equating to up to 180 water butts for a 200sq m garden!

In practice only a proportion of the plants in a garden, such as fruit, vegetables, bedding plants and container-grown plants, must be watered. Other plantings can usually be left. However, this still equates to 45 water butts. As this is far more water butts than is practical, extra water will often be needed.

A useful additional source of supply is domestic wastewater. Water containing household soaps and detergents are harmless to established plants but water containing bleach, disinfectants and stronger cleaning products must not be used. It is unhygienic to use bath and shower water on edible plants. Sewage should never be used in the garden. Prudent gardeners will alternate wastewater with mains or rainwater to prevent unwanted materials in wastewater from accumulating, especially in pots and other containers.

## Water conservation

Hedges, fences and other forms of shelter reduce evaporation caused by wind, and provide shade to help reduce water loss.

Mulching with a layer of organic matter or gravel at least 5cm thick, or using opaque mulching sheets reduces the loss of moisture from the soil. Mulching also encourages good root development in the upper levels of the soil, which increases the area of soil that the plants can explore for moisture. Little water from deeper levels is lost from it rising to the

surface so mulching only conserves moisture in the upper layers. This may amount to as much as the equivalent of 2cm of rain.

Hoeing to make a finely divided surface layer or 'dust mulch' is ineffective at reducing moisture loss and may actually increase loss of moisture. However, hoeing to remove weeds, or better from a moisture-conserving point of view, use of a weedkiller, is vital as weeds are very effective at depleting soil moisture. Similarly, cultivation of the soil in spring and summer will lead to rapid soil moisture loss.

## Soil water

When water falls on the soil, it enters the spaces between the particles that make up the soil. Water does not move down through the soil until all the pores above the descending wetted area have been filled. Therefore light watering merely wets the surface layers. It is not worthwhile just making the soil damp; it has to be thoroughly wetted for the water to travel down to the roots.

After rain or watering, the water travels by gravity downwards and air enters the partially emptied pores. Some water is retained around each soil particle by surface tension and eventually drainage ceases. The soil now holds the maximum amount of water possible. In this state, called field capacity, the soil contains air, water and nutrients, and is in the ideal condition for plants to grow.

As roots remove water, the layer around each particle becomes thinner and surface tension increases, making it more difficult for the roots to absorb and leading to wilting.

Permanent wilting point is where plants are unable to extract water.

Soil texture influences how much water it can hold. Coarse sand might hold the equivalent of 5cm of rainfall in the top 60cm of soil, while a clay soil might hold 10.5cm of rain. Hence soil that contains 5cm of rain has the potential to provide 81 litres of water per square metre to plants.

Some soil water is so tightly held by soil particles that plants cannot extract it. Clay has many small particles and retains most water, explaining its cold wet nature.

Watering should never be carried out where drainage is poor. Adding water in such situations does more harm than good, as roots are very susceptible to airless conditions when the soil is warm in summer.

The texture of heavy soils can be altered by adding coarse sand or fine gravel, but because much material is needed to change the soil texture permanently, it is not usually as effective as adding organic matter. Organic matter, for example garden compost, increases the moisture holding capacity of the soil by about 5cm of rain in the first year after application.

### Economical watering

In Britain, established plants do not usually need watering but their growth can be improved by watering when they are under drought stress. Newly sown or planted areas are more vulnerable and their watering needs should be a high priority.

### Edible plants:

Fruit and vegetables will usually crop adequately without watering, but the

quantity and quality of produce is greatly improved by watering at times when drought stress would affect the part of the plant that is gathered.

When leaves are the harvested crop, the plants should never be short of water. In practical terms watering about two weeks before harvest is usually sufficient.

### Ornamental plants

Most ornamental trees and shrubs have such extensive root systems that they are drought-proof and need no irrigation. Herbaceous perennials often need irrigation for their best performance in summer dry spells, but drought-proof borders can be attained by selection of suitable plants and management techniques. The Dry Garden at RHS Garden Hyde Hall and the Piet Oudolf Borders at RHS Garden Wisley are examples of this.

### Lawns

Perfect lawns require great quantities of water in dry weather. This is a questionable use of a scarce resource for anything other than quality lawns. In dry periods mowing should be less close and less frequent. This will keep the lawn greener for longer. Lawns usually recover when the autumn rains return.

### Watering techniques

Sprinklers have a limited use in gardens, such as watering lawns where essential and raising the moisture level of unplanted areas prior to planting. The aim of garden watering should be to apply water only at the stem bases beneath the foliage canopy, leaving the surrounding soil dry. This limits weed problems and ensures that water goes where it does most good. Fine droplets are best for watering, as

coarse droplets damage soil structure, slowing ingress of water and preventing seedlings emerging. To save time and labour, watering cans and hoses can be replaced by drip or trickle irrigation systems.

Light soils need watering more frequently than heavy soils, and because heavy soils hold more water, heavier applications of water can be given to them. Only the root zone or top 60cm of soil needs to be wetted. Water that penetrates deeper will be inaccessible to plant roots.

### When to water

Most water needed by plants is used to replenish losses from leaves. Leaves have openings or stomata to allow carbon dioxide used in photosynthesis to enter from the atmosphere. However, water is also lost from the leaves through the stomata. This is replaced by water from the roots. In effect, the evaporation from cells within leaves pulls water from the soil via the roots and conducting tubes in the plant stems to the leaves. When water becomes short, the stomata close and without carbon dioxide photosynthesis stops and plant stem growth ceases.

Soil moisture content declines as plants extract water. The difference between field capacity and current soil water status is called the soil moisture deficit. For the best plant growth irrigation should aim at replenishing the soil moisture deficit, but no more or the excess will be wasted. Commercial methods of measuring soil moisture deficit, from soil or meteorological data, are inapplicable to gardens.

Inspecting soil at a spade's depth can

provide guidance. If the soil feels damp there is unlikely to be any need to water, but if it is dry, then watering is probably required for some plants. Leaving some plants unwatered can delay maturity and usefully spread the harvest period or season of interest. Gardeners should be aware that clay feels damp even when all available water has been used, while sand can feel dry even if some water is available. Only experience in matching the observed state of an individual garden soil to the growth rate of the plants can help gardeners fine tune their watering. Wilting is usually preceded by changes in leaf position and darkening of colour.

Once lack of moisture has been identified, water may be applied to restore the soil to field capacity. A clay soil in which plants are wilting might need 81 litres per square metre and a sandy soil 60 litres per square metre, or approximately 9 and 7 two-gallon watering cans respectively. In practice gardeners are unlikely to let the soil get this dry, and water will usually be applied at the base of the plant rather than over a wide area, which greatly reduces the amount needed. As a general guide, up to 24 litres per square metre every 7-10 days will be sufficient to maintain plant growth.

In practical terms it is best to water some of the garden before drought really sets in to keep the soil moist and avoid soil moisture deficits building up (in case water restrictions are imposed later). Also, most gardeners will not have the resources to water the whole garden in a severe drought.

Light watering over a wide area is ineffective. Frequent light watering may encourage surface rooting, leaving plants more susceptible to drought. The water and time should be used to make a single thorough watering.

Information on avoiding water pollution when using or disposing of garden chemicals is given in the Conservation & Environment Guideline leaflets on '*The use of garden chemicals*' and '*Fertilizers and manures*'. These leaflets are available online at [www.rhs.org.uk/](http://www.rhs.org.uk/) publications, or by post from AW Mailing Services Ltd, PO Box 38, Ashford, TN25 6PR. Please send an A4 SAE (94p for a full set of leaflets).



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