



Watering the Garden

Reducing home water use has become a major concern. Outdoor water use makes up more than half the water consumed by the average household. With careful planning, proper soil preparation, efficient watering, and use of mulches you can make the most of every drop of water for your garden.

Watering Efficiently

Two factors influence the general practice of watering: the water available in the soil environment, and the rate the plant is using water. The first depends primarily on the soil's water-holding capacity as well as the root mass. The second depends on some special characteristics of plants that allow them to retard water use and, more importantly, on weather conditions such as temperature, wind, and humidity.

The type of soil you have influences its capacity for holding water. Soil is composed of small particles, the largest particles being classified as sand; medium-sized particles as silt; and fine particles as clay. Varying amounts of each size particles in any soil determine its texture.

Some soils may have different textures at different depths. A layer of clay or hardpan beneath a loamy soil can restrict drainage. The soil texture in many garden areas has been altered by construction activity including the addition of fill soil.

Principles of Plant Water Use

Garden plants use water as part of the photosynthetic process and to move nutrients from the soil to upper parts of the plant. A continuous flow of water moves from the root system up through the plant where it evaporates into the atmosphere. In hot, dry conditions, the loss of water to the air is greater than in cool or more humid conditions. In addition, as the size and complexity of the plant increase, there is a greater need for water.

In contrast to landscape plants, garden plants need adequate water to encourage vigorous growth. Crops should never be under prolonged water stress because yield, quality, and pest resistance may be sacrificed.

New seedling plants with a shallow, poorly developed root system may require regular shallow watering, while a mature plant with its extensive root system can use water from a larger area of the soil profile.

Garden crops differ in the size and complexity of their root system. Consider the type of plant root system when determining which water practice would be most efficient.

Water-Holding Capacity and Availability in Different Soil Textures

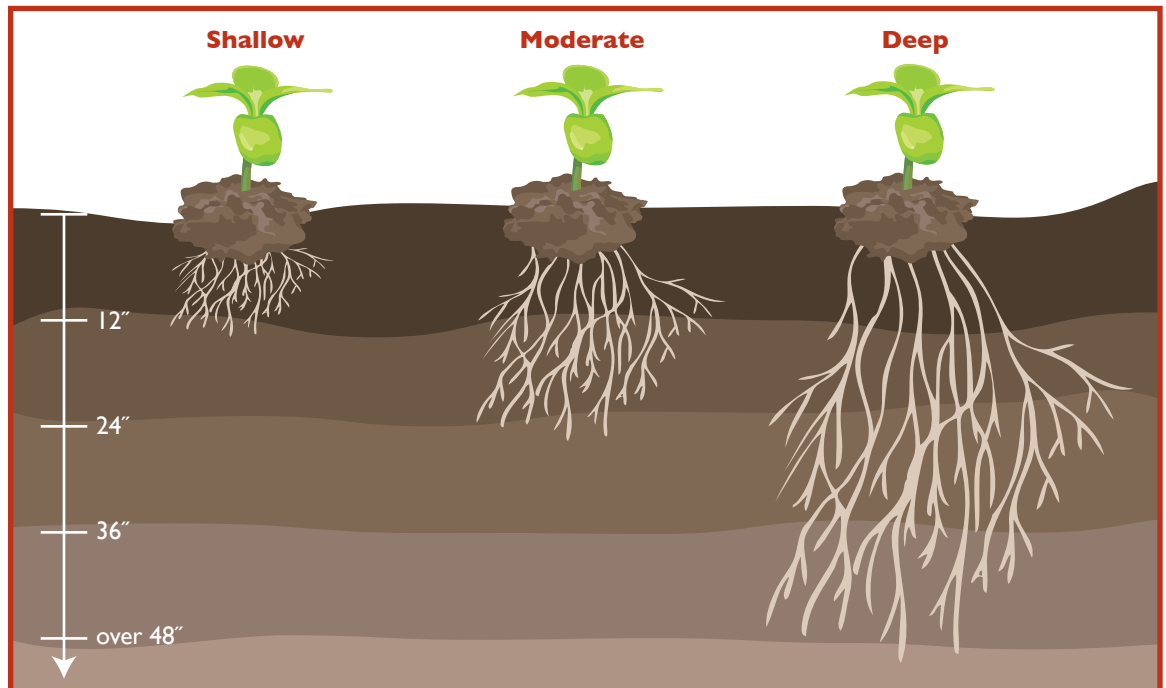
	Coarse Soils (Sand)	Mixed Coarse/ Fine Soils (Loam)	Fine Soils (Clay)
Water available (gal/ cu ft)	½ gal	1 gal	1½
Depth 1" of water penetrates	24"	16"	11"
Infiltration in 1 hour	2"	¾"	¼"

Rooting Depths of Selected Vegetable Crops

Shallow (under 24")		Moderate (36–48")		Deep (over 48")	
Broccoli	Cabbage	Beans	Beet	Asparagus	Winter squash
Cauliflower	Corn	Carrot	Cucumber	Tomatoes	Sweet potato
Lettuce	Potato	Peas	Peppers	Pumpkin	Watermelon
Radishes	Spinach	Summer squash			
Turnip					

Periods of Critical Water Needs in Crops' Life Cycle

Stage	Crop
Germination	Seedlings—especially summer and fall crops
Pod enlargement	Beans, peas
Head development	Cabbage, broccoli, cauliflower
Root enlargement	Carrot, onion, potato, radish
Flowering to early fruit set	Corn, cucumbers, squash
Early fruit development	Melons
Uniform all season	Tomatoes, peppers, eggplant



The table at left shows average rooting depths of selected vegetable crops. The development of the root system of garden crops is such that most of the water is absorbed in the upper half of the root system. Thus, if the effective rooting depth of tomatoes is 48 inches, we could assume that most of the water is absorbed in the upper 24 inches and attempt to manage watering practices to keep an adequate supply in this 2-foot area.

Suggestions for Applying Water

Some vegetables, such as lettuce and corn, have especially sparse, less developed root systems. Other crops, such as pepper and tomato, have fibrous root systems that more effectively remove water from a given area of soil.

Cool-season vegetables, planted in spring or fall, generally root to a shallower depth than warm-season and perennial vegetables. These crops may need watering more frequently in stressful periods. Because fall and spring are usually characterized by cooler temperatures and more abundant rainfall, watering during these times is usually of less concern.

In many direct-seeded crops, you must be sure that adequate water is available in the root zone to encourage germination of seeds and allow for initial growth and development. It is often necessary to provide frequent shallow watering during dry seasons until the crop develops beyond the seedling stage. This is especially true of crops planted for fall production.

With transplanted garden crops, providing water at transplanting time is essential to support the plant until it is able to absorb water from surrounding soil. In general, apply ½–1 cup of water with each transplanted vegetable. Water slowly so it soaks into the area near the plant, or water at the bottom of transplanting hole.

A garden crop needs water throughout its life cycle to survive and grow. There are several periods, however, when adequate water is critical. During these periods, the plant may respond to a lack of water by changes that are irreversible during the remainder of its life. See table at left.

Methods of Applying Water

The most popular methods of applying water to the root systems of garden crops are flood, sprinkle, and drip/trickle irrigation.

Flood. Many garden crops can be watered by “flooding” or applying a flow of water

to the soil surface. This can be done using a trench or basin near each plant or by running water down a furrow alongside each row.

This method works best in medium-textured soils that are fairly level. Water must flow from one end of the garden to another and must soak into the soil slowly in order to continue to flow in the trench.

Crops are usually planted in a raised bed when using this method so that water runs alongside the bed or row, not down the row itself.

Sprinkler. The sprinkler is by far the most extensively used watering method in home gardens. A sprinkler is inexpensive and can be used to water a diversity of crops in a small area. Distribution of water applied by sprinklers should be considered because more water is usually delivered to the center of the sprinkled area. Placing a few cans in the area to check for uniformity of water application will give you an idea of the pattern of your sprinkler.

One of the disadvantages of sprinklers is that they allow a considerable amount of water to evaporate into the air. Using coarse droplets and lower water pressure can reduce evaporation losses, especially on hot, windy days. Watering in cooler, less windy periods also helps.

When sprinkling garden crops, be sure to apply water in a way that allows plant foliage to dry as soon as possible after watering. Thus, early morning and early evening watering is preferable to late evening watering.

Drip/trickle irrigation. This method of watering is designed to keep a portion of the root zone well supplied by applying water on a daily or every-other-day basis. Drip or trickle tubes are usually laid to the side of the row or between two rows. To wet a continuous strip of soil, required by most vegetable crops, you should have a hole or “dripper” in the line every 10–12 inches. Many drip tapes come with the holes at prepunched intervals. Other types of drip tubing are designed to leak over the length of the tube.

Drip systems are usually operated at low pressures (5–15 PSI) and may require 1–3 hours a day to supply the water lost from crops during stress periods. Because of the danger of clogging the small pores of drip tape, water filtration is essential for this system. Most garden center dealers have drip irrigation kits with filters, pressure regulators, and water distribution lines. Most can offer assistance in design and layout of a drip system.

At the end of the garden season, the system can be flushed, dried, and stored in a protected



Drip tape can be laid under plastic mulch in the garden. Prepare soil well to ensure good contact with mulch. Bury edges of mulch so it doesn't blow away.

location for next year. It may be necessary to replace thin drip tubing each year. Thicker tubing may last several seasons. Use care in hoeing near drip tubing, and avoid walking on it. These activities may punch holes that interfere with the normal slow dripping of the tape.

Mulching

Mulching is an important practice that is often overlooked. Mulching can reduce the time spent in cultivating. A mulch can:

- conserve soil water
- control weed growth
- keep soil temperature uniform
- reduce frost damage to fruit.

One of the most effective ways of reducing the need to apply water to garden plants and conserve natural rainfall is to use garden mulches. Mulches are most appropriately used on summer crops when periods of water use are greatest.

Mulches provide a barrier that helps prevent moisture loss from the soil by evaporation. They also can be useful in maintaining cooler soil temperatures, controlling weeds, reducing soil compaction, and keeping produce cleaner.

Plastic mulches. Black polyethylene mulch is preferred because clear plastic mulch promotes weed growth underneath it. Plastics usually are available in rolls 3–4 feet wide.

They are placed over the row or bed, the edges covered with soil, and various sized holes cut for the different crops. Black surfaces absorb heat, warming the soil for earlier production. Later, the foliage shades the plastic, reducing the heating of the soil. These mulches work best with warm-season crops such as tomatoes, melons, peppers, and eggplant, which are usually established by transplant.

Black plastic is most widely available but other colors such as red or green are available. Thicker 'fabric' type plastics can be re-used in other seasons. Some paper or plastic coated paper mulches are becoming available as well.

Organic mulches. Common organic materials used in gardens include compost, old hay, straw, leaves, shredded newspapers, peat moss, and grass clippings. Using coarse materials requires a 3- to 4-inch layer while fine materials can be applied in 1- to 2- inch layers. Organic mulches serve as insulation, reducing soil warming in the spring, so later season use is recommended. They can be left in place and tilled into the soil during the fall as a source of organic matter. Organic materials should be dried before use. Old or composted materials are preferable. Fresh materials may form molds or slime and repel water if used when green. Also, make sure organic materials do not contain weed seeds, insects, or disease organisms that may spread to garden crops.

Ten Ways to Improve Garden Water Use

1. Water deeply, but no deeper than the root zone of the plant.
2. Water slowly. Reduce the flow.
3. Water infrequently, but thoroughly. Adjust sprinkler equipment for a larger water droplet size to help reduce evaporation. Frequent shallow watering causes plant roots to concentrate close to the surface, making the plant more susceptible to water fluctuations.
4. Loosen the soil surface and use mulches. Most mulches help to keep soil surfaces loose and receptive to water absorption.
5. Follow directions for operating and maintaining all irrigation systems. Check regularly for leaks, malfunctions, or worn parts.
6. Keep your garden well weeded to eliminate competition for water. Consider removing surplus plants from overcrowded beds to ease water demands.
7. Use wide rows with plants closer together, which reduces soil water evaporation.
8. Avoid watering during windy weather.
9. Water early in the morning when humidity is the highest for reduced evaporation.
10. Locate your garden away from trees that might compete for water.