

# Water Management

Water is essential for all plant growth. While lawns can go dormant and trees and shrubs can survive mild droughts, vegetable and flower gardens need regular irrigation to be productive. During times of drought or water restrictions, water conservation becomes a critical issue



Most gardeners are accustomed to watering flower beds and vegetable gardens. These plants require 1 to 1 1/2 inches of water per week to maintain healthy flowers, foliage, roots, and fruits. In vegetables, water makes up 80 to 95% of their fresh weight, and affects yield, fruit size, and quality. Water also prevents a variety of disorders such as toughness, off-flavor, poor filling of pea and bean pods, cracking, blossom-end rot, and misshapen fruit.

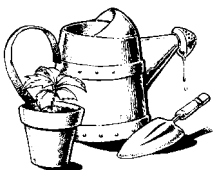
## How Is Water Lost?

- Water is lost through evaporation from the soil surface. The evaporation rate increases under hot, dry and/or windy conditions. As the soil surface dries, more water from deep within the soil may be drawn to the soil surface, where it also evaporates.
- Water is also lost by plants directly through their leaves in a process called transpiration. The rate of transpiration also increases with hot, dry and windy conditions.

## How Often Should I Apply Water?

Ideally the goal is to deliver water to the roots of the plants at about the same rate that it is removed from the soil by plant transpiration and soil evaporation. If your plants look wilted on a hot summer afternoon, that is normal. They will usually perk up overnight. If plants continue to be wilted in the morning, don't wait any longer -- water.

- A thorough soaking every 4-5 days on light, sandy soils and every 7-10 days on heavy clay soils is a good general guide for irrigating vegetables and flowers in the absence of rainfall.
- Avoid these two common watering problems:
  - Avoid frequent, light waterings. This will encourage **shallow rooting** which in turn will cause plants to suffer more during drought periods, especially if water is not available and if mulches are not used.
  - Overwatering can drown plants by filling up soil pore spaces with water, leaving little or no oxygen for plant roots. Excessive watering also leaches away nutrients which can contribute to groundwater contamination.



## Watering Considerations...

- **A Rule of Thumb...** is that in the summertime gardens need an inch of water per week whether it's provided by you or Mother Nature.
- **When You Water...** water *thoroughly* to encourage roots to grow deeply and thus use water and nutrients that lie deep in the soil.
- **The Best Time...** to apply water to your garden is in the early morning.
- **It Takes About...** 50 gallons of water to apply 1 inch of water to a 100 square foot area.
- **Drip or Trickle Irrigation...** is ideal for water conservation in gardens, reducing water usage by about 50%.
- **Postponing Irrigation...** after plants show signs of needing water can damage plants very quickly in hot weather. Observe your plants each day and respond to their needs promptly.
- **Plants...** are more susceptible to invasion by insects and diseases when under stress. Monitor plants closely for pests and take appropriate control measures.
- **The Best Way...** to improve the water-holding capacity of any type of soil is to increase its organic matter content.
- **An Organic Mulch..** of 2-3 inches can generally reduce the need for added water by 50%.
- **It's OK...** to let your lawn go dormant during periods of drought.



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## How Should I Apply the Water?

If possible, apply irrigation in a manner to keep plant foliage dry. There are three basic watering methods:

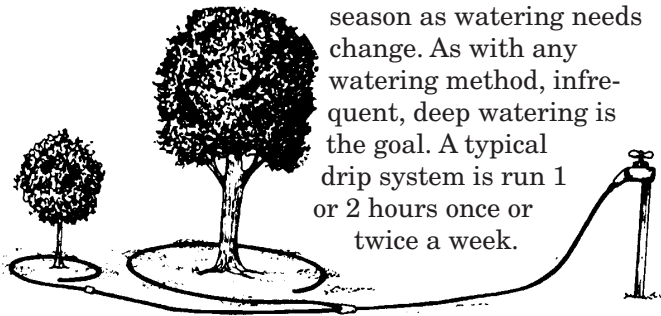
1. *Hand watering* (with a hose or a watering can)
2. *Soaker hoses and drip irrigation systems* (treated separately below)
3. *Portable sprinklers*

The method you choose will depend on the size of your garden, your budget, and your life style.

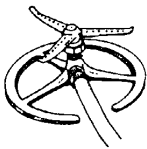
- **Hand watering** delivers water directly to the plants, thus minimizing waste. If you are hand watering, be sure to water deeply. 
- **The soaker hose** is probably the least expensive and easiest to use in a garden setting. It is a porous hose made from recycled tires that allows water to slowly seep out all along its length at a slow rate. It is laid at the base of the plants and can be left in place all season. Soaker hoses generally have a usable life of a few years. 

- **Drip irrigation** systems require an initial investment of time and money, but once installed, are convenient and conserve water. You can set up a drip system to meet the needs of individual plants precisely and then alter it throughout the growing

season as watering needs change. As with any watering method, infrequent, deep watering is the goal. A typical drip system is run 1 or 2 hours once or twice a week.

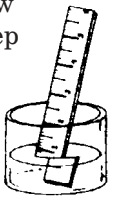


Drip irrigation provides about 90 percent of the water to the garden plant roots.

- **Sprinklers** have the disadvantage of wasting water by watering paths and other bare spots in the garden and are only 40 to 50 percent efficient. They also lose water to evaporation and wind drift. When using sprinklers, always water when there is little wind. Because they wet the foliage, sprinklers also might promote the development of leaf diseases. 

## How Much Water Should I Apply?

The rule of thumb for watering vegetable gardens is simple: vegetables need at least an inch of water per week in the summertime, whether it's provided by you or Mother Nature. This inch of water will wet the root zone to a depth of 6 to 8 inches.

- Water thoroughly to encourage roots to grow deeply and use the water and nutrients deep in the soil. With an extensive, deep root system, plants are better able to withstand dry periods. 

- Add enough water to soak the soil to a depth of 6 to 8 inches and don't water again until the top few inches begin to dry out.
- With good soil organic content, a standard in vegetable production, the garden should be able to go 5-7 days between irrigations.

## When Should I Apply the Water?

Early morning watering when the wind is low and temperatures are cool is preferred as there will be less water lost to evaporation than in the heat of the day.

- Wet foliage overnight can encourage diseases, so do not use sprinkle irrigation in the evening.
- Unless using soaker hose or drip irrigation, avoid watering at midday; evaporation losses are highest at this time.
- Avoid watering when there is wind; up to 50 percent of the water can be lost to evaporation in the air without even contacting the soil.

## How Can I Improve My Soil's Water Holding Capacity?

Soils have different water holding capacities...

- Sandy soils with large soil particles do not hold water well so they need to be watered more often but with less water.
- Heavier clay soils with many fine soil particles hold water well requiring less frequent waterings but generally with more water and at a slower rate.
- The greater the amount of organic matter in your soil, the better the water-holding capacity it will have regardless of whether it is a heavy or light soil. Organic matter in the soil with a mulch on top greatly increases a soil's ability to hold water efficiently.
- Incorporate organic matter in the form of compost, chopped up leaves or composted manure into your vegetable garden soil after the season is over to improve soil moisture retention and improve the texture of your soil.
- Consider replanting your fall garden with a green manure crop such as winter rye to add organic matter and improve soil water retention.
- As a human health (e-coli) issue, the application of manure or compost made from manure should be made at least 4 months prior to the harvesting of any edible crops.

## Will Mulching Help Hold Soil Moisture?

Once the soil is moist, mulch will help prevent water loss caused by evaporation from the soil surface, reducing the fluctuation of soil moisture and need for added water by around 50%.

- In the vegetable garden, use an organic mulch to a depth of 2-3 inches, depending upon the particle size of the mulching material. The larger the particle, the thicker the depth of mulch that should be applied.
- Some mulch choices include:
  - Leaves (chopped or shredded is best), or weed-free hay or straw can be placed 3-4 inches thick.
  - Grass clippings make excellent mulch for the flower and vegetable gardens but apply no more than 2-3 inches thick and make sure clippings do not contain any herbicide residues.
  - Newspaper, 5-6 sheets thick, placed on the soil with organic mulches on top will also conserve moisture and act as a weed barrier.
  - Pine needles, sawdust, and shredded bark can be placed on your soil 1-2 inches thick.
  - Black or colored plastic mulch (**not an organic mulch**) conserves moisture, allows the soil to warm more rapidly in the spring and also maintains a higher soil temperature. Lay down plastic early in the season; plant growth will shade the plastic from hot summer temperatures thus avoiding "cooking" the plant roots. Do not apply plastic in mid summer.
- Two cautions when using **organic mulches**:
  - Mulch only after the soil has warmed up in the spring sufficiently. Organic mulch keeps the soil temperature several degrees cooler than bare soil in the spring and delays the warming of the soil by the sun.
  - Avoid using wood or bark chips in a garden setting that requires annual soil preparation. The large pieces of chips may interfere with future seedbed preparation, especially when planting fine seeds.



The following are some guidelines and tips to help you use water effectively...

- Increase the organic matter content of your soil.
- Use mulches to conserve existing moisture.
- Switch to drip-type irrigation systems.
- Place soaker hoses or drip irrigation under mulch used in the flower or vegetable garden.
- Follow directions for operating and maintaining all irrigation systems. Check regularly for leaks, malfunctions or worn parts.
- Water infrequently, but thoroughly.
- Water deeply, but no deeper than the root zone of the plant. Sandy soil and containerized plants will need more frequent irrigation.
- Water slowly. Turn down the flow.
- Avoid watering during windy weather.
- Keep your garden well-weeded to eliminate competition for water. Also, consider removing surplus plants from overcrowded beds to ease water demands.
- Resist cultivating the soil. Any stirring of the soil will increase moisture loss. Dry weather usually reduces weed growth, so don't cultivate unless absolutely necessary. If cultivation is required, cultivate as shallowly as possible and try to leave the surface as smooth as possible.
- Use a wide-row system of planting in which plants are spaced closer together, thus reducing soil water evaporation.
- Plant in blocks, rather than rows. This creates shade for roots and reduces evaporation.
- Group plants with similar water needs (i.e. families) together on the same soaker hose. Cucumber and zucchinis and squash, for example, require similar water applications.
- Locate the garden away from trees that may compete for water.
- Avoid planting vegetables that require large amounts of water. An average size tomato plant transpires about 30 gallons of water during a season. A corn plant transpires about 55 gallons from germination to harvest.
- Know the critical watering periods for plants and you can target the timing and amount of water to add. As a rule of thumb, water is most critical during the first few weeks of development, immediately after transplanting, and during flowering and fruit production.
- Use free water. Rainwater is the best choice for your plants. It's clear, unchlorinated - and free. Use barrels or a cistern to collect water from your downspouts. A 1,000 square foot roof will collect 625 gallons of water from one inch of rain.

## Are There Water-Saving "Tricks" I Can Use?

There are several ways to conserve water in the vegetable garden, but keep in mind that vegetables (composed of 80-95% water) require "lots" of water. In times of drought, established plants may tolerate 10-14 days between waterings but be aware that problems such as fruit cracking, blossom end-rot, and blossom drop will increase. When rainfall is sparse and the sun is hot, watering is essential to your garden's success.



