

Water Conservation Tips

For Central Coast gardeners, watering is a way of life. Native plants have adapted to the long, dry stretch between late spring and early fall, but much of what we grow—including nearly all vegetables and annual flowers—has to be watered regularly in order to thrive.

By now, all of us are aware of the need to use water responsibly, whether or not rationing is in effect. Savvy water savers know that there are a range of techniques that will cut landscape and garden water needs. Here we share some of the water-conservation techniques used at the UC Santa Cruz Farm & Garden.

LEARN TO JUDGE YOUR PLANTS' WATER NEEDS

One of the best ways to conserve water is to learn how often plants need irrigation, so that water isn't wasted. "The rooting depth of a plant [see accompanying chart] will help determine how often it needs water," says horticulture instructor and landscaper John Farrell.

"For example, a squash can ultimately root down to three feet, so you can let the soil dry down farther before having to water again, as opposed to a lettuce, which has most of its roots in the first eight inches." In general, fast-growing crops such as lettuce, spinach and carrots require consistent, steady moisture. They need to be watered more often than slower-growing, deeper-rooted crops.

Soil type will also dictate how often to water. Soils with a high clay content drain slowly—they can hold water for up to two weeks; sandy soils drain quickly and may hold water for only a few days. Both types of soil will benefit from applications of compost and other organic matter. For clay soils, compost improves drainage and opens up air spaces so that roots can breathe. Adding compost to sandy soils helps the soil retain water longer—the compost acts like a sponge, absorbing and holding moisture until plants can use it.

The squeeze test can help you determine whether the soil needs water; dig down a few inches and grab a handful of soil. You need to water when: sandy soil won't retain its shape when squeezed into a ball; loamy soil looks dry and won't form a loose ball under pressure; clay soil won't form a ball unless squeezed.

When it's time to irrigate, here are some water-saving guidelines:

- Deep waterings that wet the entire root zone use water most effectively. The goal is to draw plant roots deep into the soil, where water remains available longer. If all the moisture remains in the top few inches of the bed, that's where the roots will stay, and shallow-rooted plants are especially vulnerable to drying out. Deep waterings combined with deeply dug soil will encourage roots to spread and lengthen.

An exception: just-planted seed beds and young transplants shouldn't be allowed to dry out—the germinating seeds or seedling roots are near the soil surface, which needs to stay moist. As the plants mature and their roots lengthen, they can tolerate longer intervals between waterings.

- Water early in the day, when cooler temperatures and calm conditions slow evaporation (on the coast, northwest winds make it difficult to water efficiently in the afternoon). Allow enough time for plants to dry out before evening to prevent fungus and mildew problems.

ROOTING DEPTHS OF MATURE VEGETABLES

Shallow (18-24 inches)	Moderately Deep (36-48 inches)	Deep (Over 48 inches)
Brassicas	Beets	Pumpkins
Celery	Bush, Pole Beans	Tomatoes
Corn	Carrots	Watermelon
Garlic, Onions	Cucumbers	Winter Squash
Lettuce	Eggplant	
Potatoes	Peas	
Radishes	Peppers	
Spinach	Summer Squash	

FOR THE GARDENER

- Keep an eye on the weather as you make your watering decisions. A series of cool, cloudy or foggy days will lengthen the time needed between watering sessions.

MULCH SLOWS EVAPORATION

Anything that covers the ground and blocks light can act as a mulch. This includes inorganic material such as plastic sheeting, polypropylene or polyester landscape fabrics, and old carpet.

Organic mulches range from compost, leaves, straw, and hay, to newspaper, cardboard, wood chips, bark, and sawdust.

Mulches will save water and should be used selectively. “In Santa Cruz and other coastal areas you have to be cautious about using mulches on certain plants because mulch can raise the humidity level, attracts snails and other pests, and can promote some diseases,” says Farrell. If you’re going to mulch plants such as cucumbers or tomatoes that are prone to damping off, you should wait until they’re well established and the weather has warmed up before applying mulch.

Trees and other perennial plantings are good candidates for mulching because they’re less vulnerable to moisture-related problems. A fertility-enhancing tree mulch recommended by author Robert Kourik consists of a mowed cover crop topped by phosphorous and potassium rock powders, which are covered with a layer of manure and a six-inch layer of organic mulch such as leaves, grass clippings, and straw. The mulch should extend to the edge of the feeder roots (1.5 to 3 times the radius of the tree’s canopy, depending on soil type). Don’t put mulch right up against the tree or shrub trunk or stem—leave an unmulched area extending about 1/3 of the radius of the canopy from the trunk to allow air to circulate.

Water can also be conserved by creating a “living mulch” in flower or vegetable beds. The goal is to minimize bare ground by placing plants close together; as they mature, the plants form a canopy that shades the soil and slows evaporation. Make sure the soil is rich enough to support a dense planting.

Here are some other mulching tips:

- Organic mulch shouldn’t be layered so densely that it forms an impenetrable barrier—water should be able to pass through to the soil. Clay soils will need a thinner mulch layer than sandy soils.
- When you place mulch around plantings, keep the area near the plant stem or tree trunk uncovered to allow air to circulate.
- Leaves, grass clippings (mixed with other material to keep them from matting), “chippy” horse manure

(manure mixed with straw bedding), straw or hay make a good mulch for most plants, although they will tie up some nitrogen from the soil surface as they decompose. Be sure the soil is well fed with compost or other nitrogen sources before you mulch.

- Don’t overuse resinous materials such as redwood bark or chips, since these can eventually become toxic to the plants. Sawdust and wood chips will rob nitrogen from plants if they’re mixed into the soil—layer them on the surface or use them to mulch paths.
- Straw mulches are especially effective under well-established tomato, squash, and melon plants. They cool the soil, slow evaporation, and keep the fruit from making contact with wet soil.
- Because mulch keeps the soil surface moist, roots will tend to stay closer to the surface. Make sure that you use mulch consistently throughout the summer and early fall to prevent these shallower roots from drying out. Remove mulch as the weather cools to help the soil stay warm.
- Some gardeners lay down a layer of diatomaceous earth or rock powder beneath mulch to discourage soft-bodied pests. If pests persist, you may have to restrict mulching efforts to less-vulnerable plants. Rather than mulching, try digging compost or decomposed leaves into the top few inches of soil to improve its water-holding capacity.

DRIP IRRIGATION AIDS CONSERVATION

An array of water-conserving irrigation systems, often lumped under the heading of “drip irrigation,” are now available at landscape, gardening and plumbing stores. These range from porous hoses that attach to a regular garden hose, to automated systems that incorporate programmable timers to water individual beds or plants on a preset sequence. The idea behind any drip irrigation system is to conserve water by directing it to the base of the plants, where it’s most needed. By keeping the foliage dry, drip irrigation also helps control mildew and fungus problems, as well as limiting weed growth.

At the Farm and Garden, we water many of our raised beds and row crops with drip irrigation tape that oozes water from small pre-cut holes. Tape is laid along the length of the bed or row and attached to spaghetti lines (narrow plastic tubing) that feed into a “header” of polypropylene tubing. The header can attach either to a regular garden hose or, for permanent beds, an outlet from an underground irrigation pipe. At the end of the season, we roll the tape onto spools and store it out of the sun for use the following year—tape can last for five seasons or more if stored properly.

Although they ultimately save water, drip irrigation systems have to be used more frequently than overhead systems. Because water from a drip system doesn't fill the entire root zone, the roots are localized around that wet zone and you have to maintain higher levels of moisture in that zone.

Drip irrigation is especially useful for plants that are sensitive to moisture-related diseases, such as cucumbers, squashes, potatoes, and many annual flowers. For densely planted beds of lettuce, carrots, beets, and other small plants, overhead watering with high-quality oscillating sprinklers remains the best option.

Another simple drip system uses a porous "soaker hose" made from shredded rubber that attaches to a regular garden hose. The leaky hose is laid along the length of the bed or wrapped around trees or other perennial plantings.

Trees and perennials can also be watered with micro-sprinklers, small permanent spray heads that attach to narrow "spaghetti lines" fed by larger irrigation pipes. These systems not only save water but save the hassle of moving hoses and sprinklers every time you need to irrigate. Trees should be watered in an area that extends from just inside the tree's dripline to about five feet beyond the widest limbs, where most of the feeder roots lie (note the shadow cast by a tree's foliage at midday—the shadow's outside edge marks the tree's dripline).

GENERAL SIGNS OF WATER STRESS

Plants can endure some water stress, however, extreme dehydration will cause permanent wilting and death. Some signs of water stress are:

- Greying leaves: A change in leaf color from a vibrant green to a dull grey-green or bluish color.
- Loss of sheen: Plant leaves change from glossy to dull in appearance.
- Insect damage: The presence of cabbage aphids on Brassica family crops (broccoli, cabbage, kohlrabi, etc.) will often indicate dry conditions.
- Damage to the root system: Plants that look dry even after watering often have root damage upon closer examination, e.g. from symphylans. They aren't able to uptake sufficient water.
- Red or purple leaf color: Can indicate dry conditions, or saturated conditions (anaerobic), or root damage.
- Development of small spines on the leaf margins or increased spyness on stems: especially in lettuce and related species such as endive.

- Wilting: Pay attention to the time of the day. If plants wilt early in the cool of the day, this can be a sign that they need water. Some wilting in the mid-day heat (e.g. zucchini) is a plant-protective strategy to reduce transpiration losses.
- Slower than expected growth: This can be detected over time with a practiced eye.

CRITICAL PERIODS FOR SOIL WATER STRESS BY CROP

Apples: During spring, flowering, fruit set and development
Arugula: During vegetative growth
Basil: Maturity, to prevent stress-induced flowering
Beans: Flowering, seed set, pod development
Beets: Water regularly as roots develop
Broccoli: Head development
Brussel Sprouts: Vegetative and sprout development
Cabbage: Head development
Carrots: Early root development, water to prevent cracking
Cauliflower: head development
Cilantro: During vegetative growth
Collards: During vegetative growth
Corn: During crown root development, at pollination and kernel development
Cucumbers: Flowering and fruit development
Eggplant: All stages
Fennel: Bulb development
Kiwi: During spring growth, flowering, and fruit set
Leeks: All stages
Lettuce head: Head development, pre-harvest
Lettuce leaf: All stages, pre-harvest
Melons: Flowering and fruit set
Onions, garlic, shallots: During bulb enlargement
Parsley: All stages
Parsnips: Early root development
Peas: Flowering, pollination, pod enlargement
Pears: During spring growth, flowering and fruit set
Peppers: All stages, allow dry-down between waterings
Plums: During spring, flowering, fruit set and development
Potatoes: Tuber enlargement, from flower to die-back
Pumpkins: Flowering, fruit set and development
Radishes: All stages
Small grains: During crown root stage, heading, flowering
Squashes (Summer & Winter): Flowering, fruit development
Tomatoes: All stages, but especially flowering and fruiting
Flowers: Bud development through flowering and pre-harvest

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