Easy water-wise gardening
Advice and design ideas for the 21st century.
From the editors of Sunset

Many professionals can help you design and implement a water-conserving landscape. Before deciding on anyone, get several bids and talk with previous clients.

**LOCAL WATER DISTRICTS** usually offer a wealth of information, including recommended plant lists, watering guidelines, and water-saving tips.

**LANDSCAPE ARCHITECTS** design entire outdoor environments, from plantings to structures like patios and decks. Licensed and university-trained, they can provide the whole package, from design to installation. Or they can help in specific trouble spots, such as steep slopes or areas with poor drainage.

**LANDSCAPE CONTRACTORS** are trained and licensed in methods of earth moving, construction, irrigation, and planting. They are very useful for difficult projects.

**LANDSCAPE OR GARDEN DESIGNERS** have varying degrees of education but are usually not licensed. The focus of their work is likely to be residential gardens. Often they work in conjunction with a landscape contractor.

**IRRIGATION CONSULTANTS** are usually licensed contractors associated with an irrigation-supply store (another good source of information). They can help design and install efficient irrigation systems.

**LOCAL NURSERIES** can offer useful information and assistance in choosing plants and irrigation equipment. Many have design services.

**Favorite websites**

- bewaterwise.com Low-water landscape design ideas, irrigation advice, and links to local water agencies.
- ccwater.com/conserve Contra Costa Water District’s website provides information on water conservation, landscape design, and maintenance.
- irrigation.org Information on smart controllers and efficient irrigation, and tips for hiring an irrigation contractor.
- irrigationessentials.com Information on irrigation equipment and efficient watering.
- savingwater.org The Saving Water Partnership’s website provides water-conserving information for the Northwest.
- snwa.org The Southern Nevada Water Authority’s website provides information on low-water plants, landscaping, and irrigation.
- sunset.com Sunset’s website offers landscape ideas, planting plans, and detailed information about local climate zones.
- water.ca.gov California Department of Water Resources’ website provides information on drought in California, unthirsty plants, and efficient irrigation.

Easy water-wise gardening is advice and design ideas for the 21st century. From the editors of *Sunset*.
Great gardens for a new era

IN THE WEST, water is as precious as gold. Most of our rainfall comes in winter, yet many garden plants need irrigation in summer, during our driest months. Seasonal droughts, groundwater pollution, and population growth stress this valuable resource. If we are to have enough water in the future, we must avoid wasting water in our homes and gardens today.

Of the water, Westerners use at home, about 50 percent goes to gardens. So the most important place to start a conservation program is right outside our doors. Fortunately, water conservation doesn’t mean settling for a barren landscape; it means practicing good gardening. Choosing plants well adapted to your climate, improving your soil, watering efficiently, and taking advantage of the latest irrigation technology all help save water.

Plants that require less water are widely available at nurseries. The Sunset Western Garden Book, Sunset Western Landscaping, and the online Sunset Plant Finder tool (sunset.com/plantfinder) can provide you with lists and plans. In this booklet, we offer many ways to save water in your garden, including watering strategies based on soil type, smart use of watering devices, and advice about selecting an efficient irrigation system for your garden.

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Elements of a low-water landscape

A dry garden can be as inviting as any other. Drought is a fact of life in the West. It’s part of the natural weather cycle. That’s why water conservation should be a part of your lifestyle. Happily, a well-designed water-wise landscape can be lush and colorful and will make your home a beautiful and inviting place.

Start by leaving more areas unplanted than you would if you lived in a wetter climate—a big water savings right off the top. Make the paths generous and put gravel under seating areas instead of planting a groundcover. Use decomposed granite in place of thirsty lawn grass. Then plant the remaining spaces with ornamentals that are adapted to arid climates. Finally, to highlight water’s revered status in the unthirsty garden, add a few traces of it, some real, some illusory: a fountain that barely trickles, a dry streambed that awaits the next downpour, or a lovely urn.

8 WATER-SAVING BASICS

Follow these guidelines for a water-efficient garden:

1. IMPROVE THE SOIL

Routinely cultivate the soil in your vegetable and annual beds, incorporating organic matter such as compost. Doing so improves the soil’s ability to retain moisture. Most landscape plants (trees, shrubs, and native plants especially) establish faster when planted in native soils without the addition of amendments. If your soil is sandy or rocky, you may need to add compost.

2. PLANT IN THE RIGHT PLACE

Locate unthirsty plants where they’ll get the sun (or shade) exposure and soil drainage they need. Group plants that have similar water needs so none gets too little or too much water.

3. SHRINK THE LAWN

Most lawn grasses need enormous amounts of water to stay green and lush. Reduce your lawn’s size, or—unless you need it for kids to play on—eliminate it altogether.

4. CONTROL WEEDS

These garden intruders steal water needed by desirable plants. Regularly hoe or pull them out when they’re young, or use landscape fabrics and mulches to discourage growth.

5. UPGRADE YOUR IRRIGATION SYSTEM

Add elements such as smart controllers connected to weather stations and new, highly efficient sprinklers or drip emitters to make precise watering much easier. (See pages 46–21.)

6. WATER DEEPLY

Irrigate established plants thoroughly but infrequently to encourage roots to grow downward; they will be buffered from the wet-dry cycle typical of the upper soil area and may tap into groundwater.

7. EREDEGER efficiENt

Monitor your watering practices and devices are as efficient as possible. Water plants only when needed, not by the calendar or clock. Water at night, when evaporation is much lower and the air generally calmer. Tighten faucets so they don’t leak. Avoid runoff and wasteful overspray.

8. MULCH

Cover bare ground around each plant with a 3-inch layer of mulch to help conserve soil moisture, suppress weeds, and keep the soil cooler; renew annually. Organic types such as bark chips, shredded bark, or compost improve the soil as they break down, and encourage beneficial microbes. (See pages 26–27.)

NO LAWN

Using a tapestry of groundcovers instead of thirsty turf to landscape the front yard saves precious water.

DRIP IRRIGATION

Low-flow irrigation is the most efficient way to water plants—there’s no runoff or evaporation. It’s also the healthiest system for plants because the water penetrates deeply into the soil, encouraging plant roots to do the same.

PERMEABLE PAVING

Strips of allium thyme and Asnæs maritime dissect the flagstone paving leading to the front door, soaking up rainfall and directing access to the yard on either side.

XERIC PLANTS

Native and Mediterranean plants, such as the manzanita, yarrow, Euphorbia, and Kniphofia pictured, are well adapted to the West. They require little water and maintenance, and their blue-green, gray-green foliage looks right in our light.

MULCH

A thick layer of mulch helps preserve soil moisture. But it can also enhance design, creating negative space that makes plant groupings or individual specimens stand out.

DESIGN

Jeffrey Gordon Smith
Landscape Architecture, Los Osos, CA
(jgsdesigns.com)

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SUNSET
Easy Water-Wise Gardening 5
Low water, high style

Combine flowering and foliage plants for a colorful, all-season garden

WATER-THRIFTY GARDENS deliver all the bold forms and colors of traditional landscapes, but with minimal resources and a lot less effort. As with any garden, they incorporate all the elements necessary for outdoor living and entertaining: Paths and patios to give the garden form and direction. Arbors and trellises to help divide the garden into rooms, and to create shade. Benches and outdoor furnishings for comfort. But that’s where the similarity to conventional landscapes ends.

The gardens pictured here are designed to thrive on little more than rainfall, but they offer many other advantages beyond conserving moisture. Drought-tolerant plants don’t require much, if any, fertilizer, so they tend to grow at a rate that’s easy to manage without constant pruning. Because they produce less green waste, they contribute less to landfills. In addition, many drought-tolerant plants, especially Western natives, attract birds and butterflies, which come to dine on insect pests or to sip nectar. It’s possible to have a garden that’s both water-conserving and beautiful, with plenty of lush foliage and a generous dose of seasonal flowers. All of the gardens pictured are rich tapestries of color and motion, thanks to their diverse palettes of carefully chosen natives, perennials, ornamental grasses, shrubs, or succulents.

Water-wise gardens take a bit more planning than ordinary landscapes, but over time they offer significant savings in labor costs—and, of course, water.

5 GREAT WATER-WISE DETAILS

1. BRIGHT COLORS
Yellow columbine, red valerian, and lavender catmint bloom amid a sea of mown buffalo grass in a New Mexico garden. A cluster of aspen trees provides light shade for the columbine.

2. FOLIAGE TEXTURE
Strong architectural details set the stage for this Seattle garden filled with billowy grasses and perennials. Along the gravel path, giant feather grass (Stipa gigantea) and maiden grass create clouds of straplike foliage beside catnip and Spanish lavender.

3. BOLD SHAPES
Golden barrel cacti appear to march along the top of a rock wall between fine-textured purple Dalea greggii plants. An Agave weberi adds drama behind them, while blue palo verde and desert ironwood trees soften the house walls.

4. LUSH PLANTINGS
In a San Diego garden, a dense border on a slope is filled with large native boulders. From the front are bright green aeonium, yellow pincushion (Leucospermum), yellow Cotula coronopifolia, variegated Yucca filamentosa ‘Moses’, and a red-flowering ivy geranium.

5. TWIST ON TRADITION
A suburban front yard in Long Beach, CA, planted with dark green Carex pansa, is watered only once a week in summer and mowed just four times a year.
Plants for all climates

Choose ornamentals that thrive in your region

While local natives are best suited to most sites, other good choices include drought-tolerant plants from all corners of the world. Some of the most water-wise options are native to the Southwest deserts. Others are from the five Mediterranean climate regions—California, the Mediterranean basin, South Africa, southwestern Australia, and the central coast of Chile—where rains are sparse and summers are warm and dry.

Many of these plants share characteristics that help them survive periods of intense heat and low rainfall. They may have gray or velvety leaves that reflect heat; succulent leaves, stems, and roots that store water; or needlelike leaves whose small surface area limits the potential for water loss. Or they may go dormant during the hottest months of the year.

Water-wise plants have different degrees of drought tolerance. Plants that thrive on 30 inches of rain in the Northwest, for instance, will wither in a Southwest garden where the average rainfall is 10 inches or less. Do your homework before finalizing plant choices, then group plants into zones by their water needs. Place thirstier (and often showier) plants near the house or in other high-visibility spots, less thirsty plants in the background.

Make sure your irrigation plan supports each zone independently of the others. Avoid the mistake of thinking that some types of plants never need watering. All plants, native or not, need regular, deep irrigations through the first year to help their roots become established. Some need moisture into the second year, but by then, many do fine with only an occasional deep watering. A bit of research and consulting with your local nursery or cooperative extension service will help you figure out how much water your plants need.

7 GREAT WATER-WISE PLANTINGS

1. LOW SPREADING Ceanothus griseus ‘Kurt Zadnik’ is a colorful groundcover that grows 2 to 3 feet tall and 6 feet wide or more. Spring flowers are deep blue.

2. WATER-WISE AND FIRE-WISE In a San Diego–area garden, spaces between boulders are filled with a deep pink rose-scented geranium, white nutmeg-scented geranium, and purple sweet-pea shrub.

3. WILDLIFE MAGNET Coneflower (Echinacea) is a tough perennial with daisy-like flowers in pink, lavender-purple, yellow, orange, and white. Bees and butterflies love to visit the beehive-shaped centers for nectar; finches visit later for seeds.

4. EASY TO GROW Horned poppy (Glaucium flavum) produces rosettes of crinkly gray-green leaves topped by orange to bright yellow blooms.

5. TALL, THIN TOYON Tall (usually to 10 feet), dense Toyon puts on a bright show in winter, when red berries envelop the shrub.

6. BOLD FOLIAGE Clouds of lime-colored flowers on Euphorbia characias wulfenii contrast with chocolate-hued Aeonium arboreum ‘Zwartkop’ to create drama in a San Clemente, CA, garden.


8. SUNSET 7 great water-wise plantings
Low-water planting plans

Brighten a garden bed with herbs for your kitchen or berries and flowers for birds

THE BEST PLANTS for low-water gardens not only enliven the landscape and thrive on little water once established, they have other benefits as well. Woody perennial herbs such as rosemary, sage, and thyme—all native to the Mediterranean region—produce leaves that can be used fresh or dried to flavor meat, soups, and stews. In beds and borders, they combine well with blooming perennials such as blue-flowered catmint and sunny yellow patio roses.

Unthirsty shrubs and perennials that pump out flowers, berries, or seeds invite all kinds of birds to your garden, bringing it alive with beauty and motion. (Birds also feast on pest insects.)

You can re-create one of the borders pictured at right in your own garden. The best time to plant is early fall, before rains come (they’ll help irrigate the new transplants for free). Locate both beds in full sun. The bright herb sampler is designed to fit a small (8-by-6-foot) space. The birdscape is backed with three billowy shrubs that need more room to sprawl.

The total number of each plant needed is indicated after each plant in the “Plant Lists,” far right.

POCKET-SIZE HERB SAMPLER

Just all square feet is space enough for a diverse assortment of scented herbs plus a compatible fragrant rose. Seven of the nine herbs have culinary uses, making this planting especially appealing to cooks (particularly if it’s located near a kitchen door). The two nonculinary choices—lavender cotton and catmint—add to the plot’s beauty with their soft textures and equally soft gray-green to gray-white leaf color. In fact, much of this garden’s charm derives from its varied foliage colors and textures; conspicuous flowers appear chiefly on the chives, catmint, lavender cotton, rosemary, and rose.

WESTERN BIRDSCAPE

This small planting design is suited to mild-winter areas of California and the Southwest deserts. Though it lacks trees and a watering hole, it offers most of the inducements that birds crave: berries, seeds, and shelter. The irresistible lure—as legions of gardeners have come to know—is the yearly crop of firethorn berries, but the garden’s feathered patrons will also feast on the fruits of lantana, heavenly bamboo, cotonester, and Elaeagnus. Seed-eaters will appreciate the bounty of coreopsis, blanket flower, black-eyed Susan, and fountain grass. The shrubs all afford ample shelter.

PLANT LIST

A. Chives (Allium schoenoprasum); 1
B. French tarragon (Artemisia dracunculus); 4
C. Catmint (Nepeta x faassenii); 3
D. Sweet marjoram (Origanum majorana, ‘Nana’); 3
E. Oregano (Origanum vulgare); 2
F. Rose (‘Sunsprite’); 1
G. Rosemary (Rosmarinus officinalis); 1
H. Common sage (Salvia officinalis ‘Icterina’); 1
I. Lavender cotton (Gaultheila chamaemorus ‘Nana’); 1
J. Lemon thyme (Thymus x citriodorus ‘Aureus’); 1

PLANT LIST

A. Elaeagnus x oblonga; 1
B. Firethorn (Pyracantha coccinea ‘Kasan’); 1
C. Lantana ‘Radiation’; 3+  D. Heavenly bamboo (Nandina domestica); 1
E. Willowleaf cotonester (Cotoneaster salicifolius ‘Emerald Carpet’); 2
F. Black-eyed Susan (Rudbeckia fulgida subsp. fulgida ‘Goldsturm’); 1
G. Fountain grass (Pennisetum setaceum); 6
H. Blanket flower (Gaillardia x grandiflora ‘Sunburst’); 5
I. Coreopsis grandiflora ‘Sunburst’; 4
Permeable surfaces

Let rainfall percolate down to plant roots

Paths and patios that are paved with gravel, decomposed granite, spaced flagstones, or porous concrete are the best choices for water-conserving gardens. Permeable paving materials add beauty and structure to the garden and, of course, require no irrigation themselves. Moreover, they allow rainwater and irrigation to pass through them and into the soil, preventing runoff that can clog storm drains and pollute nearby lakes, streams, and coastal waters.

If you’re considering gravel, visit your local landscape supply yard to experience the look and feel of different types. Gravel refers to rocks ranging in size from \( \frac{1}{8}\) inch to \( \frac{11}{2}\) inches. It comes in two forms: manmade crushed rock has sharp, irregular edges; nature-made river rock (also known as natural pebbles) is rounded. Think about where it will be used. For high-traffic areas, such as paths and patios, use manmade crushed rock. Because the pieces bind together well, they create a more stable surface for walking. The most common size is \( \frac{3}{8}\) inch, an all-purpose gravel that’s also good as a mulch around plantings. For a softer surface under bare feet, use \( \frac{1}{4}\) inch or finer natural pebbles. For low-traffic areas, river rock is an attractive choice, but the larger, smoother pieces are less stable underfoot than crushed rock.

You can green up surfaces covered with stone or cobbles by planting mat-forming groundcovers between the pavers. Good choices for this use include creeping thyme (shown at far upper right); Dymondia margaritacea, which forms a tight mat of narrow, gray-green leaves and tiny yellow flowers in summer; and snow-in-summer (Cerastium tomentosum), a dense, tufty mat of silvery gray foliage with small white flowers in early summer.
Efficient watering 101
Learn about your soil, watch your plants, and get the right tools

When determining how you should water, first consider your plants. Because plants with deeper roots are better able to withstand periods of drought, your goal should be to apply enough water to wet the entire root zone and to encourage deep rooting. Shallow watering leads to shallow roots and plants that are very susceptible to drought and fluctuating temperatures. You should also avoid applying so much water that it penetrates deeper than roots actually grow. That water is wasted.

Watering checklist
Hydrozoning. Organize your landscape into “hydrozones”—groups of plants with similar water, soil, and exposure needs. By doing so, it’s possible to apply water very efficiently and allocate more water to thirsty plants and less to unthirsty ones. For example, you should separate low-water users, which thrive on rainfall alone or with minimal supplemental water (such as native plants, or ones similarly adapted to drought) from high-water users (such as lawns, annual flowers, and vegetable gardens). As much as possible, maximize the amount of garden space dedicated to low-water users.

Observe your plants. Get to know the signs of moisture stress, such as droopy, off-colored foliage.

Know your soil. Examine it frequently, making sure it is not too wet or too dry between waterings. If necessary, add organic matter to new planting areas to improve soil texture or to hold moisture better.

Water deeply, then let the soil partially dry before watering again. Irrigate long enough to wet the entire root zone. To determine how deep the water is penetrating, push a stiff metal rod into the soil after watering. It will move easily through wet soil but will stop or be harder to push when it hits dry soil. Before watering again, let the top few inches of soil dry out, depending on the size of the plant.

Avoid runoff. Don’t apply water faster than the soil can absorb it. Direct water to plant roots by building basins or furrows of soil around plants. Use terraces or basins to avoid runoff on slopes. Pulse-irrigate plants in clay soil or on slopes. Apply water until puddles appear, stop until the water is absorbed, then repeat the cycle until water penetrates to the desired depth. Use drip or low-volume irrigation (see pages 18–21).

Adjust watering schedules with the weather and seasons. Water less often in cool weather, more frequently during hot weather. Irrigate early in the morning, when winds are calm and evaporation is low. (See “How season affects watering,” page 25.)

HOW TO CHOOSE THE RIGHT HOSE
A cheap hose prone to kinks and cracks makes gardening a chore. It pays to invest in quality.

• Hoses may be made of rubber or vinyl or a combination of the two. The best models incorporate multiple layers of reinforcing fabric such as nylon or rayon. Hose couplings and swivels are another indication of quality. The strongest couplings are made of brass—the thicker the better—and the best swivels are hexagonal for easy gripping. Also look for a protective collar just below the coupling. It’s designed to prevent the hose from kinking at the faucet.

• Garden hoses vary in length (25, 50, and 100 feet) and diameter (5/8, 3/4, and 1 inch). A 5/8-inch hose can deliver about a third as much water as a 3/4-inch hose. If you have low water pressure or if you must run your hose uphill, buy the shortest, largest-diameter hose that’s practical for your situation.

USE A HOSE IN FURROWS
1. Basins 3 to 6 inches deep hold water around plants. On level ground, link basins to make watering easier.

2. Furrows 3 to 8 inches deep help a hose-end bubbler attachment irrigate straight rows.
Efficient watering: with sprinklers

A good choice for overhead irrigation of a large area

**FOR LARGE LAWNS** and some vegetable and flower beds, underground sprinkler systems are a good option. To operate properly, they need high pressure (40 psi or more at the water source). You may want to hire a professional to plan and install the system, which entails much physical labor. However, sprinkler manufacturers provide good instructions, and many people decide to do the job themselves.

**Design your system**

To design an underground irrigation system, follow these steps:

- **Make a scale drawing of your property.** Include new or existing landscaping, hardscaping like paths and patios, and any existing underground utilities. Divide your property into hydrozones.
- **Visit an irrigation supplier.** Take time to familiarize yourself with components listed and shown in the photograph on the facing page. Pay attention to sprinkler output rates and nozzle spray patterns.

**Sketch your system**

Stores or nurseries that specialize in irrigation supplies can help you plan and draw an irrigation system, or you may prefer to have a professional do the design. Regardless, it makes sense to be involved with the design process. Here are some basic tips when planning a system.

**Limit heads.** Use as few sprinklers as possible to achieve head-to-head coverage: Spray from one sprinkler should reach the head of the next sprinkler. For full coverage, each area should be covered by three sprinklers.

**Isolate sprays.** Position sprinklers to prevent overspray into neighboring hydrozones or paved areas.

**Simplify the course.** Plot layout of underground pipes with fewest turns.

**Group by valve.** Plot circuits—a group of sprinklers controlled by the same valve—to correspond to the hydrozones. Everything on one circuit (valve) will be watered at the same time. Your water pressure and flow rate will determine how many sprinklers you can have on each circuit. Each circuit should comprise the same type of sprinklers: spray or rotor. Don’t mix the two.

**Maintain your sprinkler system**

To make sure your system operates efficiently, often watch it run to check for signs of leaks, malfunctions, or poor performance. Adjust sprinklers when necessary, and uncoil heads with a knife or piece of wire. Replace broken sprinklers or risers. Water-filled valve boxes or leaking sprinklers may be a sign that valves need to be repaired or replaced. Wet spots and a constantly running water meter are other signs of problems. In freezing climates, install a drain valve at the lowest point in each circuit. Before winter freeze, drain the system through the drain valve, and hire a professional to blow compressed air through the system to clear remaining water.

**USE THE RIGHT COMPONENTS**

**Control valves.** These include backflow (anti-siphon) devices to prevent water from flowing into the home water supply.

**Tips:** Valves are usually grouped together so they can easily be wired to electronic controllers. PIPE: These are made of rigid, white polyvinyl chloride (PVC). To glue or thread sections of pipe together, you’ll need fittings that come in various configurations (including T and elbow) and types (slip and threaded).

DISCONNECT: These vertical pieces of pipe connect sprinklers to underground pipes. They may be 12 to 18 inches tall to clear shrubs, 6 inches or less for lawn sprinklers.

**Tip:** You can buy adjustable polyethylene risers at the desired height, as well as cutoff types that allow a choice of heights. (A swing joint makes it easy to adjust the height and angle of sprinkler heads.)

**Sprinkler heads.** There are two basic categories: spray and rotary (rotors). Spray heads emit a fixed spray, whereas rotors—both gear-driven and impact types—move as they shoot out single or multiple streams of water. Spray heads are generally for smaller areas, throwing water in about a 15-foot radius. Rotor covers up to about a 45-foot radius but need more pressure to operate. Because they apply water at a slower rate than spray heads, rotors must run for longer periods to wet an area, but they are less likely to cause runoff.

**Tip:** Both spray heads and rotors are available in stationary sprinklers and pop-ups.

**Nozzle tips:** Both spray heads and rotors have nozzles that emit water proportionately: a 90° nozzle delivers a quarter of the water a full-circle nozzle delivers. Variable-arc nozzles (pictured below) can be adjusted from 0° to 360° of spray; nozzles are also available for small areas and irregular shapes. All rotors have adjustable arcs, although how you make the adjustment varies by model and manufacturer.

**Tip:** Easy-to-change nozzles adjust application rates between heads with different arcs.

**Sprinkler Coverage**

This illustration shows how to position sprinklers to ensure even coverage. Sprinkler heads at the corners cast water in an arc, while the center head waters in a circle. Dark tint indicates water overlap.

**Nozzle Spray Patterns**

For proper coverage, typically you must set some nozzles to different arcs than others.

**Elements of a Sprinkler System**

- **Nipple**
- **Pop-up sprinkler**
- **Cutoff riser**
- **PVC slip by thread T**
- **PVC pipe**
- **Swing joint**

**CLOCKWISE FROM TOP LEFT: GEORGE OLSON, THOMAS J. STORY, EM AHART**

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**Sprinkler Coverage**

- **Spray overlap**

**Sprinkler heads**

- **Spray heads** emit a fixed spray, whereas rotors—both gear-driven and impact types—move as they shoot out single or multiple streams of water. Spray heads are generally for smaller areas, throwing water in about a 15-foot radius. Rotor covers up to about a 45-foot radius but need more pressure to operate. Because they apply water at a slower rate than spray heads, rotors must run for longer periods to wet an area, but they are less likely to cause runoff.

**Tip:** Both spray heads and rotors are available in stationary sprinklers and pop-ups.

**Variable-Arc Nozzle**

A simple twist changes the spray pattern of a variable-arc nozzle to the desired segment of a circle.
Irrigation

Efficient watering: a drip system

The wise choice for focused, localized irrigation

WHILE UNDERGROUND RIGID-PIPE sprinkler systems use high water pressure and volume to disperse water over a large area, drip or low-volume irrigation delivers water at low pressure and volume (in gallons per hour) to specific areas, often just to individual plants. Penetration of water is slow, so depth regulated by the length of time the system is on.

The result is well-watered plants, using less water than with sprinklers. Drip emitters, which release water directly to the soil, waste virtually no water; even minisprayers and minisprinklers, which spray water into the air, deliver less water than ordinary sprinklers do. Emitters and minisprinklers are available in many different styles, varying primarily in output (gallons per hour) or, in the case of minisprinklers, in the size and shape of watering pattern.

A drip-irrigation system can be connected to your main water line or operated from a hose bibb or the end of a hose. It is possible to convert an existing rigid pipe system to a drip system (see page 20).

State-of-the-art irrigation systems

Irrigation technology is evolving rapidly, making watering easier and more efficient. If you consider yourself technically adept, you might want to include some of the latest products in your system. Most need to be monitored very carefully to operate properly, so there is a commitment involved, but they can be very useful.

Rain sensors. They’re hooked into automatic controllers to override irrigation when significant rainfall occurs.

Subsurface irrigation. Using in-line drip emitters enclosed in black polyethylene tubing (also called emitter line) is an alternative way to water lawns. The tubing is buried 4 to 8 inches below the turf and usually spaced 12 to 18 inches apart, depending on the soil type. Within the tubing there are individual emitters spaced every 12 to 18 inches. One manufacturer infuses emitters with an herbicide to prevent grass roots from growing into and clogging the openings.

To find out more about moisture sensors and subsurface irrigation, consult suppliers that specialize in irrigation equipment.

Irrigation controller: Best friend or worst enemy?

When connected to a well-designed irrigation system, a properly set automatic controller can reduce waste and do a better job of watering than most gardeners can. But controllers are only as good as the people who use them. Many homeowners don’t know how (or have forgotten how) to set them properly or don’t make adjustments with the seasons. If that sounds familiar, spend some time reacquainting yourself with your controller.

Multiple-program controllers provide the most efficient way to irrigate different areas of the garden with differing water needs. Programs allow you to set when the system comes on (say, Tuesdays and Fridays at 6 a.m.) and how long it runs (run time). Multiple start times allow the water to be delivered in shorter spurts. For example, the controller can water the lawn for 10 minutes, turn off the water for an hour, then water for another 10 minutes. This pulse-irrigating translates into very little waste due to runoff. Water budgeting features allow you to step up or step down the run time with the seasons or weather.

But it’s important to get used to reprogramming the controller to suit plants’ changing water needs. Adjust your irrigation schedule at least monthly to reflect changes in weather and day length. For example, a lawn that requires watering 4 days per week in July will generally need watering only 3 days per week in September and 1 or 2 days per week in October.

Doing it yourself

Some homeowners prefer to install small drip systems by themselves. For detailed instructions, consult the information provided by suppliers. If you install a system yourself, you’ll need to create a scale drawing of your yard to calculate equipment needs. For an extensive system, it’s best to hire a professional.

USE THE RIGHT COMPONENTS

CONTROL VALVE that turns each zone or station on the system

BACKFLOW PREVENTER (antisiphon device) for each zone (may be part of the control valve setup)

PRESSURE REGULATOR to reduce pressure of incoming water so setup won’t blow apart

FILTER to remove dirt particles from water

PVC PIPES to transport water to your planting areas

POLYETHYLENE TUBING (1/2 inch) and microtubing (1/4 inch) to deliver water from the main line to emitters

FITTINGS (compression, barbed, and locking, to connect the components) and end caps

EMITTERS, MINISPRINKLERS, AND OOZE TUBES to apply water to plants

FLUSH VALVE to aid in cleaning dirt out of your system (in areas with dirty water) or to drain water out of the system (in climates with freezing temperatures)

THE RIGHT COMPONENTS

Hose bibb
System shutoff valve
Control valve
Pressure regulator
PVC pipe
End cap
Microspray
Emitter
Automatic controller
Pop-up polyethylene tubing
Filter
1/2-inch polyethylene tubing
This landscape in Encinitas, CA, thrives on rainfall in winter and spring; an all-drip system takes over in summer. Low-water plants include Aloe arborescens (with orange spires), Aeonium arboreum (with yellow cones), and purple statice.

Elements of a drip system

FROM LEFT: Steven A. Gunther, Thomas J. Story

Subsurface irrigation. Using in-line drip emitters enclosed in black polyethylene tubing (also called emitter line) is an alternative way to water lawns. The tubing is buried 4 to 8 inches below the turf and usually spaced 12 to 18 inches apart, depending on the soil type. Within the tubing there are individual emitters spaced every 12 to 18 inches. One manufacturer infuses emitters with an herbicide to prevent grass roots from growing into and clogging the openings.

To find out more about moisture sensors and subsurface irrigation, consult suppliers that specialize in irrigation equipment.

Irrigation controller: Best friend or worst enemy?

When connected to a well-designed irrigation system, a properly set automatic controller can reduce waste and do a better job of watering than most gardeners can. But controllers are only as good as the people who use them. Many homeowners don’t know how (or have forgotten how) to set them properly or don’t make adjustments with the seasons. If that sounds familiar, spend some time reacquainting yourself with your controller.

Multiple-program controllers provide the most efficient way to irrigate different areas of the garden with differing water needs. Programs allow you to set when the system comes on (say, Tuesdays and Fridays at 6 a.m.) and how long it runs (run time). Multiple start times allow the water to be delivered in shorter spurts. For example, the controller can water the lawn for 10 minutes, turn off the water for an hour, then water for another 10 minutes. This pulse-irrigating translates into very little waste due to runoff. Water budgeting features allow you to step up or step down the run time with the seasons or weather.

But it’s important to get used to reprogramming the controller to suit plants’ changing water needs. Adjust your irrigation schedule at least monthly to reflect changes in weather and day length. For example, a lawn that requires watering 4 days per week in July will generally need watering only 3 days per week in September and 1 or 2 days per week in October.

Doing it yourself

Some homeowners prefer to install small drip systems by themselves. For detailed instructions, consult the information provided by suppliers. If you install a system yourself, you’ll need to create a scale drawing of your yard to calculate equipment needs. For an extensive system, it’s best to hire a professional.

State-of-the-art irrigation systems

Irrigation technology is evolving rapidly, making watering easier and more efficient. If you consider yourself technically adept, you might want to include some of the latest products in your system. Most need to be monitored very carefully to operate properly, so there is a commitment involved, but they can be very useful.

Rain sensors. They’re hooked into automatic controllers to override irrigation when significant rainfall occurs.

Subsurface irrigation. Using in-line drip emitters enclosed in black polyethylene tubing (also called emitter line) is an alternative way to water lawns. The tubing is buried 4 to 8 inches below the turf and usually spaced 12 to 18 inches apart, depending on the soil type. Within the tubing there are individual emitters spaced every 12 to 18 inches. One manufacturer infuses emitters with an herbicide to prevent grass roots from growing into and clogging the openings.

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Shading shows vertical wetting pattern; notice how much deeper water goes in sandy soil than in clay.

How deep does your drip system have to run to supply enough water to plants. For heavier soils, you should irrigate with lower gallon-per-hour (gph) emitters. Then run the system longer to supply enough water to plants.

The right emitter depends on your plants and soil type:

- The heavier the soil, the slower it absorbs water.
- The heavier the soil, the slower it absorbs water.

Choosing the right emitter depends on your plants and soil type:

- Sandy Loam: One 2-gph; next to plant
- Sandy Loam: One 1-gph; next to plant
- Sandy Loam: One 0.5-gph; next to plant
- Sandy Loam: Two or three 2-gph; evenly around plant
- Sandy Loam: Two or three 1-gph; evenly around plant
- Sandy Loam: Two or three 0.5-gph; evenly around plant
- Sandy Loam: Three to six 1-gph or two or three 2-gph; on 3-loop or two lines on opposite sides
- Sandy Loam: Two or three 3-gph; installed as above
- Sandy Loam: Two or three 1.5-gph; installed as above
- Sandy Loam: Four or five 2-gph; on 3-loop or two lines on opposite sides
- Sandy Loam: Four or five 1-gph; installed as above
- Sandy Loam: Four or five 0.5-gph; installed as above
- Sandy Loam: One 1-gph; at rootball
- Sandy Loam: One 0.5-gph; at rootball
- Sandy Loam: Several 2-gph; about a foot apart in a row
- Sandy Loam: Several 1-gph; about 3/6 feet apart in a row
- Sandy Loam: Several 0.5-gph; about 3/6 feet apart in a row
- Sandy Loam: One or more 1/2- to 1-gph
- Sandy Loam: One or more 1/2- to 1-gph
- Clay: Several 2-gph; about a foot apart in a row
- Clay: Several 1-gph; about 3/6 feet apart in a row
- Clay: Several 0.5-gph; about 3/6 feet apart in a row
- Clay: One or more 1/2- to 1-gph

**PLANTS** | **SOIL** | **WHICH EMITTER AND WHERE**
--- | --- | ---
Low shrubs | Sandy Loam | One 2-gph; next to plant
Low shrubs | Sandy Loam | One 1-gph; next to plant
Low shrubs | Sandy Loam | One 0.5-gph; next to plant
Medium to large shrubs | Sandy Loam Clay | Two or three 2-gph; evenly around plant
Medium to large shrubs | Sandy Loam Clay | Two or three 1-gph; evenly around plant
Small trees (8- to 15-foot canopy) | Sandy Loam | Three to six 1-gph or two or three 2-gph; on 3-loop or two lines on opposite sides
Small trees (8- to 15-foot canopy) | Sandy Loam | Three to six 3-gph; installed as above
Small trees (8- to 15-foot canopy) | Sandy Loam | Two or three 3-gph; installed as above
Ground-covers, spaced at least 2 feet apart | Sandy or Loam | One 1-gph; at rootball
Ground-covers, closely spaced | Any soil | Overlapping misirraps or misirrappers (or follow drip guidelines below for “Beds of flowers or vegetables”)
Beds of flowers or vegetables | Sandy or Loam | Four or five 2-gph; on 3-loop or two lines on opposite sides
Beds of flowers or vegetables | Sandy or Loam | Four or five 1-gph; installed as above
Beds of flowers or vegetables | Sandy or Loam | Four or five 0.5-gph; installed as above
Containers | Potting soil | One 1-gph; at rootball
Containers | Potting soil | One 0.5-gph; at rootball

**HOW DEEP**
Shading shows vertical wetting pattern; notice how much deeper water goes in sandy soil than in clay.

**HOW WIDE**
Horizontal coverage is also important; below we list the area covered by drip emitters.

**EMITTER FLOW RATE** | **SANDY SOIL** | **LOAM SOIL** | **CLAY SOIL**
--- | --- | --- | ---
1/2 gph | 1 sq. ft. | 1 sq. ft. | 1 sq. ft.
1 gph | 5 sq. ft. | 11 sq. ft. | 11 sq. ft.
2 gph | 11 sq. ft. | 18 sq. ft. | 18 sq. ft.
3 gph | 17 sq. ft. | 31 sq. ft. | 31 sq. ft.

**Punching pointers**
When making holes in drip tubing for emitters and barbed fittings, use a punch designed for that purpose. Be sure the tubing is straight—if it is twisted, the emitter could end up on the top, causing water to run along the tubing instead of dripping down onto the soil. The hole should be positioned so that the emitter will drip to the side or downward. Hold the punch at a right angle to the tubing to ensure a round hole that will seal tightly against the emitter’s Barb. You may find the piercing process easier if you slowly twist the punch as you push it into the tubing. On some punches, the tip may become clogged with extracted tubing, clear it out before punching again.

**Convert your sprinklers to drip**
If some circuits of your conventional sprinkler system are watering plants that could be more efficiently irrigated with drip, you can retrofit your system by making use of the existing underground pipes. The various conversion systems call for removing all the conventional sprinklers on a circuit, connecting drip components at one or more risers, and capping all risers that aren’t used. In most cases, you must add a filter and pressure regulator to the line.

**Maintain your drip system**
As your garden matures, you’ll need to install new emitters and increase the number of emitters watering your plants. You’ll also need to check your system occasionally to look for clogged emitters or broken lines. Here’s a season-by-season guide to drip-system maintenance.

**Beginning of the season**
- Open the end caps or flush valve.
- Clean filters.
- Run water through system to clear, replace end caps.
- After the first couple of uses in spring, make sure wetting pattern is as expected.
- If emitter isn’t working, clean or replace it.
- Inspect lines for leaks.
- Adjust automatic controller if necessary.

**Peak season**
- Check for evidence of leaks, such as puddles or eroded soil, and secure loose tubing.
- Replace or clean clogged emitters and misirrappers.
- Move emitters farther from plant’s base as the plant grows; add emitters.
- Clean the filter as needed.
- Adjust timer with the changing seasons.

**Winter**
- In cold-winter areas, remove end caps and caps on filters and drain lines.
- In freezing weather, shut off pressurized water, bring battery-operated timers indoors, drain valve assemblies [antisiphon control valve, filter, and pressure regulator], and open end caps.

**Troubleshoot your drip system**

- **THE PROBLEM:** One plant looks thirsty.
  - **THE SOLUTION:** Dig into root zone, and if soil is dry, check to see if the emitter is clogged. If emitter works but there are extensive dry areas, there probably aren’t enough emitters around the plant.

- **THE PROBLEM:** Plants on one line look thirsty.
  - **THE SOLUTION:** Look for a break in the line between last healthy plant and first thirsty one.

- **THE PROBLEM:** Plants look yellowish; soil is wet.
  - **THE SOLUTION:** You are overwatering; reduce watering time.

- **THE PROBLEM:** Plants look yellowish; soil is wet.
  - **THE SOLUTION:** You are overwatering; reduce watering time on valve.

- **THE PROBLEM:** Water puddles on the surface.
  - **THE SOLUTION:** You probably have clay soil; change emitters to a lower gph, or run the system for a shorter time and repeat cycles.

**Drip kits for pots**
A basis-free way to water container plants automatically.

- Using a timed drip-irrigation system to water containers ensures your garden-in-pots gets the water it needs—without waste—even if you’re neglectful or on the go.
  - You can choose a prepackaged kit; many are easy to put together. Get one that includes a timer, a filter, a pressure regulator, and an antisiphon device (also called a backflow preventer or vacuum breaker), which keeps irrigation water from being drawn back into the public water system and is required by many localities.
  - If your kit doesn’t have these components, purchase them separately. Different manufacturers’ components usually aren’t interchangeable, so if you think you may need extra parts, it’s best to buy from a vendor that sells individual drip-irrigation pieces.
  - Position containers where you want them before you lay any tubing (and measure carefully since it’s hard to remove fittings once they’re connected). On a timed system, the plants should have similar water needs; try to use containers in the same size range. After you set up, turn your system on and monitor it for a couple of cycles to make sure everything works properly. Look for leaks and assess flow, adjusting as necessary.

- **SOURCES:** DripWorks (driptworks.com); Raindrip (raindrip.com) sells separate components and offers advice for customized systems.
Irrigation

The right watering system
Which irrigation system is best for you?

Lawn (A)
- Hose-end sprinklers can work well for a small lawn.
- Underground sprinklers attached to a controller will water a large or small area more precisely.

Annuals and perennials (B)
- Overhead watering may cause flowers to droop or spotting on petals; certain species are more subject to disease if not carefully watered.
- Underground sprinklers with pop-up risers work in extensive flower beds. Risers should be tall enough that foliage doesn’t block spray.
- Choose drip-emitter lines for beds with closely spaced plants, individual emitters for widely spaced plants.

Vegetables (C)
- Hand-water with basins and furrows.
- Use soaker hoses on flat ground.
- Install a low-volume system with emitter line for closely spaced plants, individual emitters for widely spaced vegetables.
- Position plants with similar watering needs. Bigger plants need deeper irrigation than small plants or seedlings do. Plants that are flowering or setting fruit need more water.

Groundcovers (D)
- Use underground sprinklers; select stationary heads for plantings more than a foot tall and low-precipitation-rate heads for groundcovers on a slope.
- Drip emitters are suitable for shrubby groundcovers.
- Drip microsprays work well for mass plantings of small groundcovers.

Roses (E)
- Soaker hoses work well on level ground.
- Underground sprinklers with flat-head sprayers run early in the day keep leaves dry, helping to prevent disease.
- Drip irrigation with emitter line works well with closely spaced bushes. Or use individual emitters for each bush.

Trees and shrubs (F)
- Use soil basins to direct water to roots and avoid runoff (see page 15).
- Soaker hoses work for occasional deep-watering of established trees.
- Low-volume systems with emitters or microsprinklers are most efficient, especially on sloping ground.

Natives and drought-adapted plants (G)
- Use oozie-type soaker hoses at low pressure.
- Use low-flow drip with a manual shutoff valve.
- Natives and drought-adapted plants need little to no water after they are established.

Container plants (H)
- Hand-water gently with a nozzle.
- Submerge pots for a half-hour in tubs of water to saturate soil.
- Use drip for pots. Water small pots two to five minutes several times a day. Big pots require more water per application but less frequently (see page 21).

Choose the right professional
Hiring a professional to help install an irrigation system is like hiring any other skilled contractor.
- Get several quotes.
- Ask for client references, and contact them to make sure they were happy with the work.
- Ask to see a contractor’s license, certificates of insurance, and proof of any special irrigation training.
- Make sure you will get the features you want. Find out which brands and models of irrigation equipment (especially sprinklers and timers) will be used and why.
- Ask about plants in each hydrozone and how the system will need to be changed or updated as plantings mature.
- If your landscape uses native plants, make sure the contractor has experience designing systems that suit the plants’ special needs.
- Discuss the main principles of irrigation and judge whether the potential installer knows up-to-date systems. Here are some good questions to ask:

- What are the best sprinklers for the lawn? Are sprinkler heads a minimum of 4 to 6-inch pop-ups? Will they be properly spaced for head-to-head coverage?
- Will the system need built-in check valves and pressure-regulating valves?
- Can the irrigation system be tailored for the various plantings (hydrozones) in the yard? What is the best way to water each zone?
Irrigation

How to manage thirsty plants

Annuals, vegetables, roses, and lawns usually need a lot of watering. Here are ways to save water but also have a better-looking lawn and healthier plants.

**Annuals**

Use less-thirsty types. African daisies, California poppies, celfasta, creeping zinnia, cosmos, dwarf morning glories, gailardia, marigolds, nicotiana, petunias, portulaca, salvia, snow-on-the-mountain, verbena, and vinca can all get by on less water than most other annuals can.

Plant only for visual impact. Limit planting to areas where they’ll be seen up close, such as near entryways or around patios and decks. Start with small plants, or sow seeds. These will develop more extensive root systems than larger plants, using less water over the long haul.

**Vegetables**

Plant in furrows. Dig furrows 6 to 8 inches deep, then sow or plant in the bottom of the trench, not on the sides or top of the furrow.

**Roses**

Plant bare-root. Winter planting gives bare-root roses plenty of time to get established before hot weather. Cut back on watering after spring bloom. Many established roses—especially old shrub and species kinds—can get by on surprisingly little water.

Know your sprinkler system. How season affects watering.

**Lawns**

Still firmly rooted in backyards across the West, lawns are responsible for as much as half of outdoor residential water use, and studies show that most are significantly overwatered.

Know your sprinkler system. To find out how much water your sprinklers apply, place five straight-sided cans or cups (more cups will give a better reading) randomly on your lawn. Run the sprinklers for 15 minutes, then measure the water in each cup. For example, if ¼ inch of water collects in 15 minutes, your sprinklers deliver 1 inch an hour. If necessary, make adjustments. Also watch sprinklers run, and fix leaks, clogs, obstructions, and broken heads.

Cut back on fertilizer. Too much nitrogen encourages water-thirsty new growth.

Switch to low-volume sprinklers. These apply water at a rate slow enough for the soil to absorb.

**How season affects watering**

Plants use more water during hot, dry weather, so you need to irrigate more in summer than in spring or fall. (In winter in many areas, you don’t need to water at all.) Also, wind dries out plants faster than still air, so plants require more water during windy weather. Day length also influences water requirements. From January until June 21 (summer solstice) days grow longer, while from late June until December 21 (winter solstice), they grow shorter. That’s why in July, during a week of longer, 80°/days, your landscape will require more water than during a week of 80°+ days in December.

As obvious as this sounds, gardeners often forget to adjust automatic controllers according to weather and seasons. Gardeners should water less in cool weather, turn sprinklers off altogether in winter or during rainy spells, and increase watering when it’s windy or hot.

The illustration above shows the maximum weekly water needs of some lawns in Northern California. The sprinkler run time (the minutes column) is based on an application rate of 2 inches per hour spread out over a week. It peaks in July, and decreases to nothing in midwinter.
Savings

Mulch: more than a pretty face
Six of our favorites, plus the basics you need to know

HAZELNUT HULLS
Good for general use and ideal for paths because hulls let water pass through easily and don’t stick to shoes. Most readily available in and around Oregon’s Willamette Valley. Apply 2–3 inches.

DECOMPOSED GRANITE (DG)
Compacts quickly and doesn’t tend to blow away. Especially attractive in Southwestern and desert landscapes, but can be prone to weeds. Apply 1–2 inches.

CUT BARK
Made from different types of wood based on where you live; a good all-purpose choice. The mini size shown here gives landscapes a polished look. Apply small size 2–3 inches; larger, 4–5 inches.

SHREDDED BARK
Slow to decompose, with a more woody, natural look than cut bark. Braided bales and shredded pieces knit together so they stay in place. Useful on slopes and in rocky areas. Apply 1–3 inches.

TUMBLED GLASS
Prissy fits; 4–7 a pound or more. Ideal for adding color and punch to small areas.

STRAW
Light, loose option lets water pass through easily; good around vegetables and strawberry beds. Buy at livestock-feed stores. Don’t use hay, which has seed heads that may germinate come spring. Apply 4–5 inches.

Decomposed granite (DG)
Compacts quickly and doesn’t tend to blow away. Especially attractive in Southwestern and desert landscapes, but can be prone to weeds. Apply 1–2 inches.

Tumbled glass
Pricey ($3–$7 a pound or more), so used mainly to add color and punch to small areas.

Hazelnut hulls
Good for general use and ideal for paths because hulls let water pass through easily and don’t stick to shoes. Most readily available in and around Oregon’s Willamette Valley. Apply 2–3 inches.

Add mulch and save water

Q&A: the basics
No matter what condition your garden is in, adding a layer of mulch will give it a clean, freshly planted look. But the benefits of mulch are not just cosmetic. Mulching is one of the best ways to maintain soil moisture (and to save on your water bill), insulate roots from both heat and cold, and minimize the need to weed.

Depending on your garden situation, many materials can make great mulches.

At left is a sampling of our favorites, which are widely available in bags or in bulk from nurseries and landscape supply centers. Here’s what you need to know to get started.

Q: What exactly is mulch?
A: Generally speaking, mulch is any material that protects soil surface and allows air and water through. Mulch is useful over an area of bare soil and around planted areas. Organic mulches (derived from plant material) add nutrients over time and enrich overall soil composition, so they’re hard to beat. Composted, aged manure, raked leaves, pine needles, and thin layers of lawn clippings (as long as they’re herbicide- and pesticide-free) all work for various situations. You can also opt for an inorganic mulch such as gravel, granite, or stone.

Q: Will manure burn my plants?
A: It can burn the roots of your plants if it’s not well composted, so look for bag labels that specifically say “well-composted manure.” Be sure to ask your supplier if you are purchasing in bulk.

Q: How much should I buy?
A: Determine the square footage you want to cover and use the following as a guide: A 2-cubic-foot bag covers an area of 8 square feet to 3 inches deep; 1 cubic yard of mulch covers an area of 488 square feet to 3 inches deep.

Q: How thickly should I apply the mulch?
A: In general, the denser the mulch particles, the less you need.

Q: Any application tips?
A: Spread mulch to the appropriate thickness, taking care to keep it a few inches away from tree trunks and the crowns and stems of plants. If placed too closely, mulch can retain moisture and cause plants to rot.

Q: How can I keep my mulch clean?
A: Inevitably, leaves and other debris will fall on your mulch. You can remove litter with a small hand rake. Some people use blowers, but lighter mulches may blow away along with unwanted material.

Q: When should I mulch?
A: At least once a year in early spring before weeds sprout. You can also add a second layer as a top dressing in late fall.

Q: When do I remove it?
A: You can leave mulch in place indefinitively. Just scrape it aside if you want to plant in a mulched area.

Q: What’s the best way to mulch container plants?
A: Use the same depth and application technique as for mulching on the ground.

How a water meter can track water use
Your water meter can tell you how much water you are using during a given time period, and can help you monitor the amount of water you use indoors and outdoors on a daily basis. It can also help you figure out how much water each appliance uses, and whether there’s a leak inside or outside the house. But first you’ll need to learn to read your meter.

How to read your water meter
Most water meters are located in ground concrete boxes toward the street curbs. To expose the gauge, remove the cover and flip open the meter’s cap.

Straight reading meters (the simplest, most common type) can tell you how much water you’re using in a given period. Simply record the figures shown on one day and then again a day or two later, and subtract the original reading from the new reading. To convert cubic feet to gallons, multiply by 7.48. Using the same process, you can test the amount of water used to take showers or irrigate your garden. Turn off all water inside and outside the house, read the meter, then run sprinklers; take a new reading.

Many new water meters, including the one pictured, come with a leak detector—a small triangle in the center of the meter that rotates when any amount of water is used. If the triangle rotates even when all the water is turned off, there’s a leak somewhere.

If your meter is of a different style from those mentioned here, call your water agency for help reading it.

How your meter can help you check for leaks
To check for leaks, turn off all water faucets (including your ice maker). If your meter doesn’t have a leak detector, it will have a sweep hand. Record the meter reading or mark the needle position with a pencil or piece of tape. Keep the water off. Wait at least 15 to 30 minutes (some leaks take a cycle).

Reread the meter gauge to determine if any water has been used. If a leak is detected, likely culprits are toilets and irrigation systems.
Storing up on a rainy day
Four ways to harvest and store precious rainwater

Plant a rain garden
When rain falls in Seattle, homeowner Lyn Dillman smiles: “Water that used to run down the street now pools in a thickly planted infiltration basin, where it percolates into the groundwater below. ‘It’s a win-win situation,’” says landscape designer Malissa Gatton. “The garden helps reduce this household’s environmental footprint. Anybody could do it.”

If you have soil that drains well, a rain garden is a satisfying way to take advantage of a free natural resource. Channel rainwater from the roof into a shallowly buried pipe that empties into an infiltration basin or swale at least 10 feet away from your house, where it can replenish groundwater. Grow water-tolerant plants such as shrub willows in the basin.

INFO
Pictured cisterns are from Texas Metal Cisterns ($380 for 200-gallon size to $1,070 for 1,200-gallon size; texasmetalcisterns.net).

Hang a rain chain
Rain chains replace downspouts. The 8½-foot chain pictured spills into a 16-inch-diameter bowl (it attaches to the bowl so it won’t whip in the wind). The water then overflows slowly into a rock-covered catch basin. INFO Copper Bells rain chain ($165) and hammered-copper dish ($45; rainchains.com)

INSTALL A RAIN BARREL
Rain barrels typically hold about 50 to 60 gallons each—enough to irrigate houseplants or pots on the deck. The best type is made of recycled food-grade plastic (or use a recycled wine barrel like the one pictured), with an intake line, spigot, overflow attachment, screen cover to keep out leaves, and removable solid cover. Position the barrel beneath a downspout; to keep the rainwater pure, remove the solid cover an hour or two after rainfall has washed pollen and other pollutants off the roof. Rain barrels cost about $100 to $150 each.

ADD A CISTERN
An inch of rain puts about 600 gallons of water atop a 1,000-square-foot house. Rain gutters capture it; from a downspout, you can direct it into a cistern to help water your garden. At Islandwood Environmental Learning Center on Bainbridge Island, Washington, three steel cisterns store rainwater from a nearby roof. By the time vegetables start growing in spring, the tanks are full and the water travels through a gravity-fed drip system to irrigate crops.

INFO Pictured cisterns are from Texas Metal Cisterns ($380 for 200-gallon size to $1,070 for 1,200-gallon size; texasmetalcisterns.net).
Putting it all together

Eleven elements of a water-conserving landscape

When winter rains come, it may be tempting to dream of planting large lawns and lush flower beds. Yet many regions of the West receive less than 10 inches of rain per year, and periods of drought are part of the West’s natural cycle. Keeping the big picture in mind can help you make smart landscaping decisions. Any of the landscape features described here can result in substantial water savings.

**SHADE TREES ON THE WEST SIDE OF THE HOUSE**
Choose deciduous types that shade and cool the house during summer, then drop their leaves to allow in sunlight during winter. Unthirsty choices for mild climates include Chinese pistache and honey locust.

**SAXAEAEAL**
Install an automatic controller to schedule irrigation times. Reset programs seasonally and after power outages.

**IRRIGATION CONTROLLER**

**PAVERS WITH SPACERS AND UNTHRISTY PLANTS**
For patio surfaces, opt for pavers such as flagstones or recycled concrete pieces. Grow unthirsty plants such as creeping thyme or snow-in-summer in spaces between.

**PAVERS WITH SPACERS AND UNTHIRSTY PLANTS**

**PERMEABLE DRIVEWAY**
Use decomposed granite or pavers with spaces between; this allows rainwater to pass into the soil, rather than running off down the street.

**PERMEABLE DRIVEWAY**

**LOW-WATER TURF**
If you must have a patch of lawn, keep it small and choose a native grass that’s appropriate for your region. Examples: Blue grama, buffalo grass (desert areas), Creeping red fescue, Pacific-hair grass (Deschampsia cespitosa holciformis).

**LOW-WATER TURF**

**PLANTS GROUPED BY WATER NEEDS**
Place thirsty plants together and drought-resistant plants elsewhere. Then put plants that need regular water on separate irrigation systems and schedules.

**PLANTS GROUPED BY WATER NEEDS**

**RAIN-HARVESTING SYSTEM**
Channel rainwater from your home’s downspout into a subsurface catchment basin where it can replenish the groundwater.

**RAIN-HARVESTING SYSTEM**

**DROIT-TOUIR GROUNDCOVER**
For areas that don’t get foot traffic, choose unthirsty groundcovers such as *Artemisiastruus sune-us*, Carmel Creeping couch, low-growing junipers, or creeping thyme.

**DROIT-TOUIR GROUNDCOVER**

**TOUGH SHRUBS**
Fill borders or spaces along fences with undemanding, low-water beauties such as achillea, lavender, rosemary, or smoke bush (*Cotinus coggygria)*.

**TOUGH SHRUBS**

**DRIIT-IRRIIT/Raised Beds for Vegetables**
Use drip tubing or soaker hoses in raised beds; they get irrigation where plants need it, with no runoff or waste.

**DRIIT-IRRIIT/Raised Beds for Vegetables**

**COMPOST BIN**
To turn your garden’s brown plant waste into deep rich compost, dig finished compost into the soil to improve its soil’s water-absorbing capability.

**COMPOST BIN**

**DRIP-IRRIGATED RAISED BEDS FOR VEGETABLES**
Use drip tubing or soaker hoses in raised beds; they get irrigation where plants need it, with no runoff or waste.

**DRIP-IRRIGATED RAISED BEDS FOR VEGETABLES**

**DROIT-TOUIR TOLERT PLANTS**
Wuous trees are thirsty, but they can survive drought, although they’ll produce smaller fruits, and fewer flower buds next year. But they’ll be better off with a deep irrigation in April and again in June. (Citrus may need additional deep watering in summer; watch for yellowing, or curling leaves.)

**DROIT-TOUIR TOLERT PLANTS**

**HOW TO FIGHT DROUGHT**
When drought comes, and with it the possibility of local bans on lawn watering or punishing fines in water bills, what can you do? It’s too late at that point to install a water-conserving landscape, since even drought-tolerant plants need water to get established. But you can take steps to save the plants you have.

Save established trees and shrubs first. These are costly to replace and have the greatest impact on your landscape. (A lawn can be replaced in an afternoon from soil, but a 70-foot-sal reseeded can take 20 years or more to replace.) Landscape trees such as oak, birch, poplar (riparian trees that in nature grow near water), alder, coast redwood, magnolia, and Japanese maple are often the first plants to show signs of drought stress. Weakened trees like Monterey pine may not die directly from drought but invite borers, which can finish them.

Give the trees a deep irrigation in late spring and they’ll be far better equipped to withstand drought. The roots of various plants grow to different depths; the trick is to apply just enough water to moisten the roots without going beyond. Most tree roots are located in the top 2 feet of soil. The drip line of a tree or shrub runs around the perimeter of the canopy and virtually outlines the root zone on the ground below. Once you identify the root zone, focus your resources on that area. To increase water penetration before watering, drill ½-inch holes 1 to 2 feet deep every few feet around the drip line and fill them with organic mulch, or use a spade or pitchfork to rough up the soil surface. If the soil is dry at a depth of 12 to 18 inches (check it with a sampling tube), moisten the soil at 24 inches deep.

Coir soaker hoses around the tree at the drip line and halfway between the drip line and the trunk; apply mulch over the root area; then allow hoses to run slowly overnight. For most big trees, you’ll need about 2 gallons of water per inch of trunk diameter; riparian trees need twice that amount.

Reduce lawn watering. To stay green all summer, lawns need 1 to 2 inches of water per week. Turn on the sprinklers for about 10 minutes once a week, turn them off to let moisture soak in, then turn them on again for another few minutes. Or cut back to 1 inch of water every two weeks; under this regimen, lawns turn straw-colored and go semidormant but bounce back quickly after weather cools in fall. Also, mow high and keep the mower blades sharp. Don’t overfertilize; too much nitrogen encourages the production of thirsty new growth.

**HOW TO FIGHT DROUGHT**

**Rainwater harvesting systems:**
Channel rainwater from your home’s downspout into a subsurface catchment basin where it can replenish the groundwater. Channel rainwater from your home’s downspout into a subsurface catchment basin where it can replenish the groundwater.