SMART GARDENING IDEAS

Subscribe to Sunset magazine for landscaping inspiration and gardening advice tailored to your climate in each monthly issue. Visit sunset.com or call 800/777-0117.

Use these companion books from Sunset to help you garden successfully in your climate zone. Available at your local bookseller and home and garden center.

Sunset Plant Finder

Looking for the right low-water plant for your climate and gardening style? Go to ***sunset.com/plantfinder*** *and search by type, growing conditions, and color.*

Where to get help

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.

www.nrcs.usda.gov Tips for backyard conservation.

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.

Sunset

Easy water-wise gardening

Advice and design ideas for the 21st century. From the editors of Sunset

THOMAS J. STORY

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.

CONTENTS

A gorgeous mix of low-water plants, including California fescue, carex, catmint, erigeron, 'Garnet penstemon, lavender, Mexican bush sage, Morning Light miscanthus, and rosemary.

SAXON HOLT

Design

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 every Westerner's 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 precision watering much easier. (See pages 16–21.)

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. IRRIGATE EFFICIENTLY Make sure 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.
DESIGN Jeffrey Gordon Smith Landscape Architecture, Los Osos, CA (*jgsdesigns.com*)

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 elfin thyme and *Armeria maritima* dissect the flagstone paving leading to the front door, soaking up rainfall and directing excess 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.

STEVEN A. GUNTHER

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 strappy foliage beside catnip and Spanish lavender.

3. BOLD SHAPES Golden barrel cactus 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 *Furcraea foetida* 'Mediopicta', 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.

CLOCKWISE FROM TOP LEFT: SAXON HOLT; ANDREW DRAKE; D.A. HORCHNER/DESIGN WORKSHOP; BOB WIGAND; SAXON HOLT

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 spare 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 nearest 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.

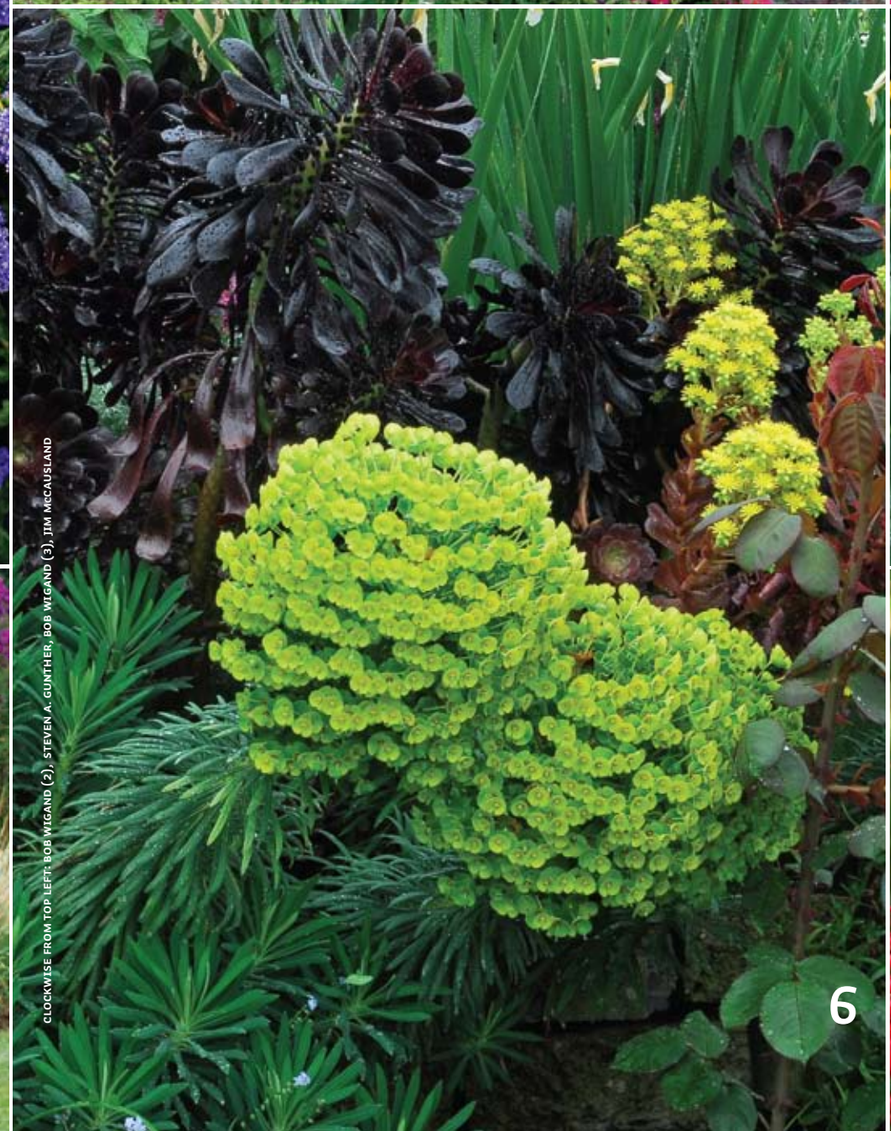
3. WILDLIFE MAGNET Coneflower *(Echinacea)* is a tough perennial with daisy-like flowers in pink, lavender-purple, yellow, orange, and white. Bees and butterflies love to visit the beehive-shaped centers for nectar; finches visit later for seeds.

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

5. BRIGHT BERRIES 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.

7. SHAPE AND TEXTURE Mediterranean-climate plants fill a garden border in a rain shadow along Washington's Puget Sound. They include *Aster* 'Mönch' and *Schizostylis coccinea* 'Oregon Sunset', framed against 'Gold Sword' New Zealand flax. Behind is tall, airy *Verbena bonariensis*.



CLOCKWISE FROM TOP LEFT: BOB WIGAND (2), STEVEN A. GUNTHER, BOB WIGAND (3), JIM MCCAUSLAND

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.


Chives


Lemon thyme


Catmint


Common sage


Blanket flower


Black-eyed Susan

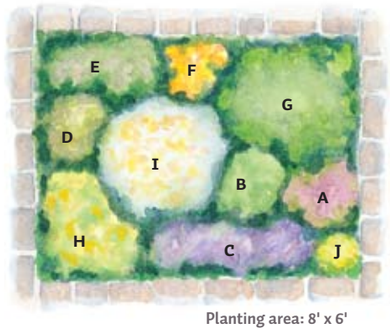

Fountain grass


Firethorn

OPPOSITE, CLOCKWISE FROM TOP LEFT: DAVID CAVAGNARO, THOMAS J. STORY (3), BEN WOOLSEY, CLAIRE CURRAN, NORMAN A. PLATE (2); ILLUSTRATIONS, FROM TOP: LOIS LOVEJOY (2), ERIN O'TOOLE (2)

POCKET-SIZE HERB SAMPLER

Just 48 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.



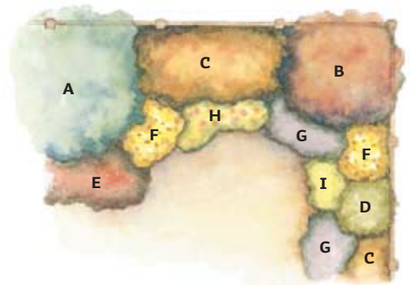
Planting area: 8' x 6'

PLANT LIST

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

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, cotoneaster, and *Elaeagnus*. Seed-eaters will appreciate the bounty of coreopsis, blanket flower, black-eyed Susan, and fountain grass. The shrubs all afford ample shelter.



Planting area: 25' x 18'

PLANT LIST

A. *Elaeagnus* x *ebbingei*; 1
B. Firethorn (*Pyracantha coccinea* 'Kasan'; 1
C. Lantana 'Radiation'; 3+
D. Heavenly bamboo (*Nandina domestica*); 2
E. Willowleaf cotoneaster (*Cotoneaster salicifolius* 'Emerald Carpet'); 2+
F. Black-eyed Susan (*Rudbeckia fulgida sullivantii* 'Goldsturm'); 11
G. Fountain grass (*Pennisetum setaceum*); 6
H. Blanket flower (*Gaillardia* x *grandiflora*); 5
I. *Coreopsis grandiflora* 'Sunburst'; 4

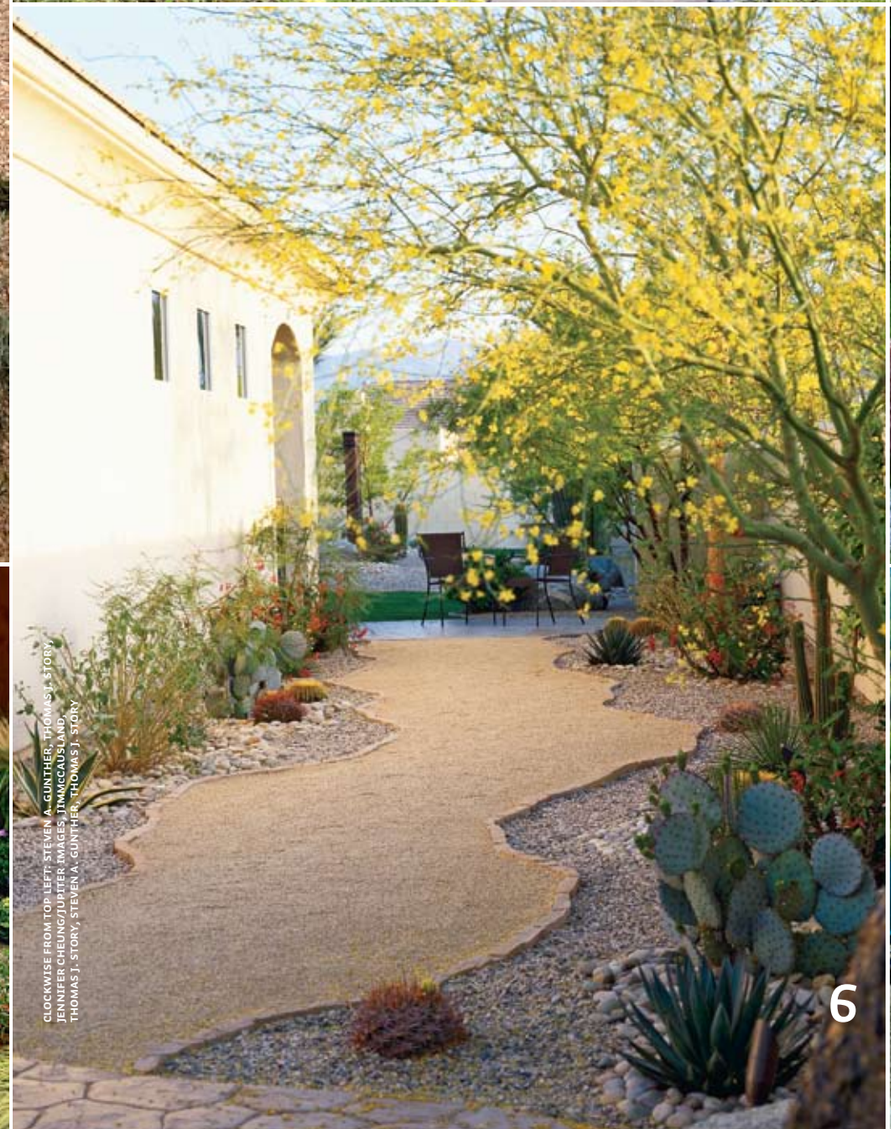
Permeable surfaces

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 ⅛ inch to 1½ 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 ⅜ inch, an all-purpose gravel that's also good as a mulch around plantings. For a softer surface under bare feet, use ¼-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 margaretae,* 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.



CLOCKWISE FROM TOP LEFT: STEVEN A. GUNTHER; THOMAS J. STORY; JENNIFER CHEUNG/JUPITER IMAGES; JIMMCCAUSLAND; THOMAS J. STORY; STEVEN A. GUNTHER; THOMAS J. STORY

Irrigation

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.)

MANUAL WATERING DEVICES

Hand watering can be very efficient: You can pinpoint individual plants and vary watering times based on plant needs and weather. The right devices make it easier.

1. PORTABLE SPRINKLERS They feature different spray methods: oscillating, rotating, impulse, or traveling. Choose a heavy-weight model with a pattern that matches the shape of the area to be watered and that applies water evenly over the entire area.

2. SOAKER HOSES Flat hoses perforated on one side or porous "ooze" types work best on level ground. Run them along rows of vegetables, flowers, or hedges; spiral around trees; or use to moisten beds of seedlings.

3. HOSE-END NOZZLES Nozzles turn water flow into a variety of sprays, from strong jet to gentle mist. Those with long handles are especially helpful for watering hanging baskets. (If the nozzle doesn't already have a shutoff valve, you can connect one between it and the hose.)

CLOCKWISE FROM TOP LEFT: THOMAS J. STORY, CRAIG D. WOOD, NORMAN A. PLATE, THOMAS J. STORY, DARROW M. WATT

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 (½, ⅝, and ¾ inch). A ½-inch hose can deliver about a third as much water as a ¾-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:

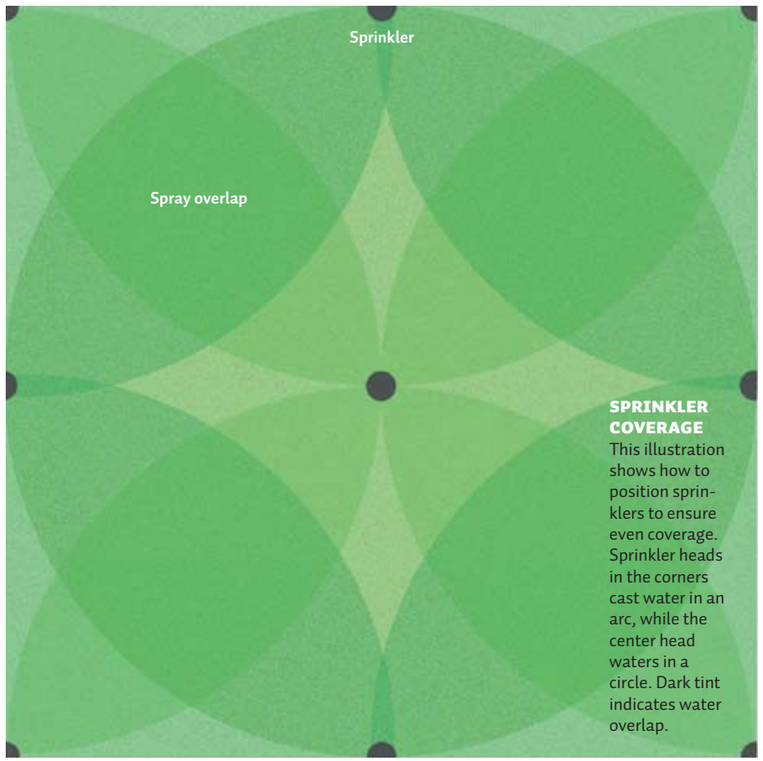
Make a scale drawing of your property. Include new or existing landscaping, hardscaping like paths and patios, and any existing underground utilities. Divide your property into hydrozones.

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.



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

CLOCKWISE FROM TOP LEFT: GEORGE OLSON, THOMAS J. STORY, EM AHART (2)

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

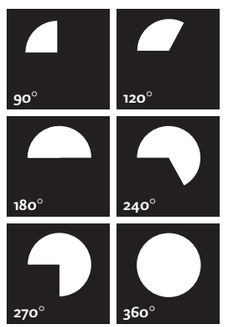
Simplify the course. Plot layout of underground pipes with fewest turns.

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.

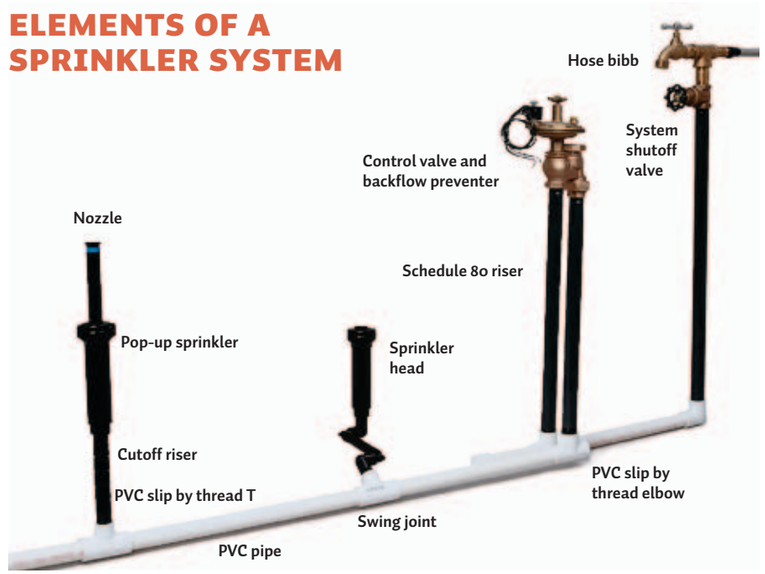
Maintain your sprinkler system

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 unclog 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.

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



ELEMENTS OF A SPRINKLER SYSTEM



USE THE RIGHT COMPONENTS

CONTROL VALVES These include backflow (anti-siphon) devices to prevent water from flowing into the home water supply.
TIP: Valves are usually grouped together so they can easily be wired to electronic controllers.
PIPES 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).
RISERS 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. Rotors cover 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.
NOZZLES These determine a sprinkler head's pattern of spray, radius of throw, and amount of water delivered. Choose the pattern carefully to fit the shape of the area. Most spray heads 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.

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

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 dispense 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, its 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).

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.

FROM LEFT: STEVEN A. GUNTHER, THOMAS J. STORY

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?

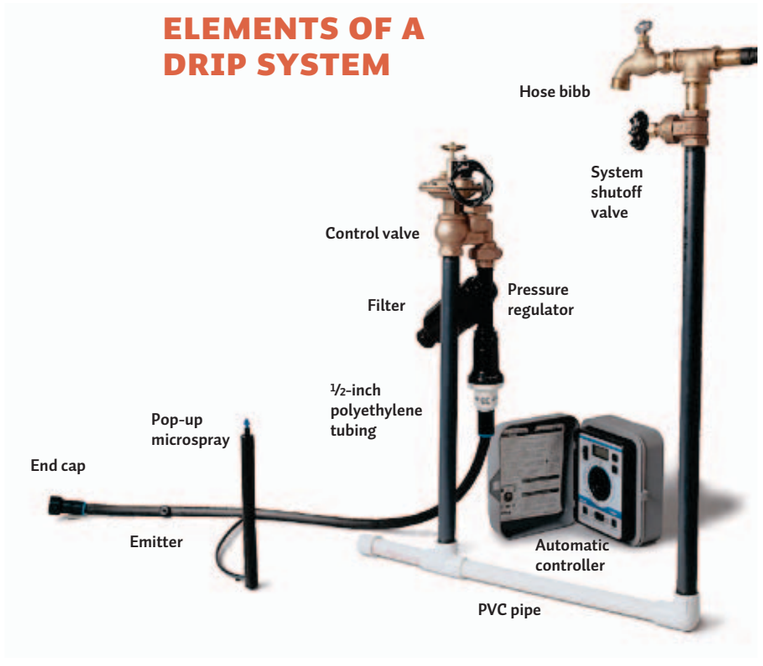
When connected to a well-designed irrigation system, a properly set automatic controller can reduce waste and do a better job of watering than most gardeners can. But controllers are only as good as the people who use them. Many homeowners don't know how (or have forgotten how) to set them properly or 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 runs 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 (½ inch) and microtubing (¼ 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 emitter depends on your plants and soil type

The heavier the soil, the slower it absorbs water. So for heavier soils, you should irrigate with lower gallon-per-hour (gph) emitters. Then run the system longer to supply enough water to plants.

PLANTS	SOIL	WHICH EMITTER AND WHERE
Low shrubs	Sandy Loam Clay	One 2-gph; next to plant One 1-gph; next to plant One ½-gph; next to plant
Medium to large shrubs	Sandy Loam Clay	Two or three 2-gph; evenly around plant Two or three 1-gph; evenly around plant Two or three ½-gph; evenly around plant
Small trees (6- to 8-foot canopy)	Sandy Loam Clay	Three to six 1-gph or two or three 2-gph; on J-loop or two lines on opposite sides Two or three 1-gph; installed as above Two or three ½-gph; installed as above
Larger trees (10- to 15-foot canopy)	Sandy Loam Clay	Four or five 2-gph; on J-loop or two lines on opposite sides Four or five 1-gph; installed as above Four or five ½-gph; installed as above
Ground-covers, spaced at least 2 feet apart	Sandy or loam Clay	One 1-gph; at rootball One ½-gph; at rootball
Ground-covers, closely spaced	Any soil	Overlapping minisprays or minisprinklers (or follow drip guidelines below for "Beds of flowers or vegetables")
Beds of flowers or vegetables	Sandy Loam Clay	Several 2-gph; about a foot apart in a row Several 1-gph; about 1½ feet apart in a row Several ½ -gph; about 1½ feet apart in a row
Containers	Potting soil	One or more ½- or 1-gph

HOW DEEP

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

Sandy Loam 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
½ gph	1 sq. ft.	5 sq. ft.	11 sq. ft.
1 gph	5 sq. ft.	11 sq. ft.	18 sq. ft.
2 gph	11 sq. ft.	18 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.

ABOVE: CRAIG D. WOOD; ILLUSTRATION AT RIGHT: NIK SCHULZ

Beginning of the season

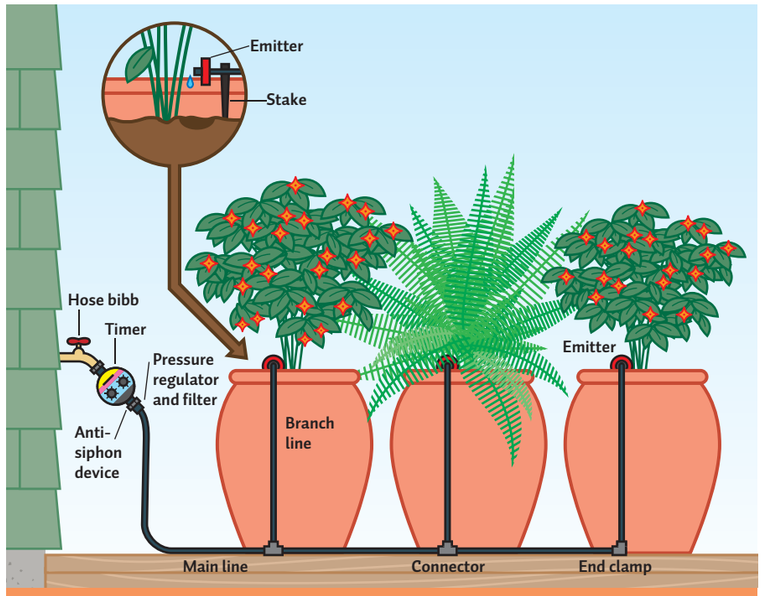
- Open the end caps or flush valve.
- Clean filters.
- Run water through system to clear; replace end caps.
- After the first couple of uses in spring, make sure wetting pattern is as expected. If emitter isn't working, clean or replace it.
- Inspect lines for leaks.
- Adjust automatic controller if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

Peak season

- Check for evidence of leaks, such as puddles or eroded soil, and secure loose tubing.
- Replace or clean clogged emitters and minisprinklers.
- 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.



DRIP KITS FOR POTS

A hassle-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 (*dripworksusa.com*) and Raindrip (*raindrip.com*) sell kits; the Urban Farmer Store (*urbanfarmerstore.com*) sells separate components and offers advice for customized systems.

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 on one valve look thirsty.
THE SOLUTION: If emitters are working, you may be underwatering.
THE PROBLEM: All plants look thirsty.
THE SOLUTION: Check your controller and the on-off or rain shutoff button and reset if necessary. If they are fine, check moisture around roots. If soil is dry, look for a break in main water line before the valves. If system is in good repair, increase 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.

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 minisprays 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)

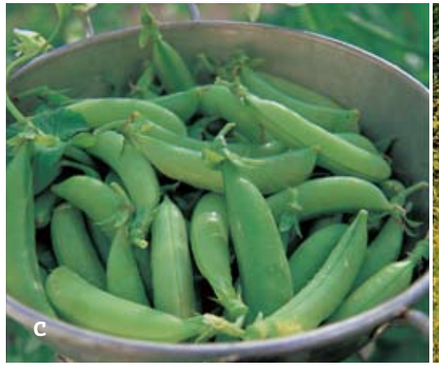
- Use soil basins to direct water to roots and avoid runoff (see page 15).
- Soaker hoses work for occasional deep-watering of established trees.
- Low-volume systems with emitters or microsprinklers are most efficient, especially on sloping ground.

Natives and drought-adapted plants (G)

- Use ooze-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).



CLOCKWISE FROM TOP RIGHT: SANDRA LEE REHA, THOMAS J. STORY, NORMAN A. PLATE, JIM McCAUSLAND, NORMAN A. PLATE, THOMAS J. STORY, NORMAN A. PLATE (4)

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:

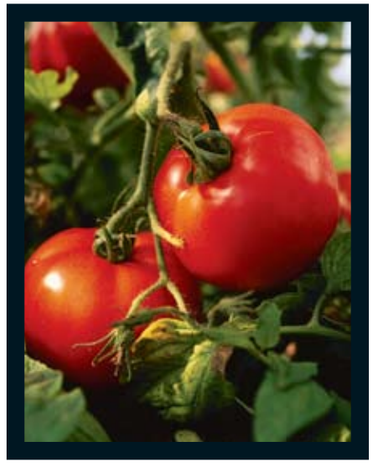
What are the best sprinklers for the lawn? Are sprinkler heads a minimum of 4- to 6-inch pop-ups? Will they be properly spaced for head-to-head coverage?

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?

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, celosia, creeping zinnia, cosmos, dwarf morning glories, gaillardia, 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 plantings 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.
Plant in part shade. Particularly in inland areas, provide shade from hot late-afternoon sun.
Work the seasons. Plant when the weather is ideal for quick establishment (in most cases, fall is the ideal time to plant). For planting times, see the *Sunset Western Garden Book*.
Group plants close enough that mature plants will completely shade the soil.

Vegetables

Whenever possible, start plants from seed. These plants usually develop stronger and deeper roots.
Buy small transplants. Avoid seedlings that are obviously rootbound.
Try heirloom varieties. These include 'Anasazi' beans, which are well adapted to hot, dry climates.
Time planting to let vegetables get well established before warm weather. For planting times, check the *Sunset Western Garden Book*.
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.
Build basins around vegetables that need wide spacing—squash, melons, and tomatoes.
Plant tomato seedlings deep. Leave just the top two leaves exposed; plants will develop better root systems.
Plant close together. Space plants so the foliage will eventually touch; this will shade the soil and discourage weeds.
Plant early-ripening varieties. They will need fewer irrigations.

Roses

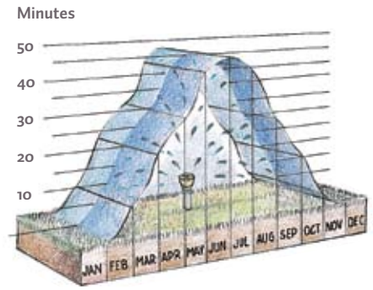
Plant bare-root. Winter planting gives bare-root roses plenty of time to get established before hot weather.
Cut back on watering after spring bloom. Many established roses—especially old shrub and species kinds—can get by on surprisingly little water.
Mulch heavily. Use at least 3 inches of organic matter; replenish often.
Remove suckers. Wait until next winter to do other pruning.
Don't deadhead. Let hips develop to suppress growth.

It s natural to want a lawn if your household includes active kids. But choose the right grass and keep the lawn small and well managed to minimize water use.

FROM LEFT: NORMAN A. PLATE, STEVEN A. GUNTHER

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.
Mow higher. Set your mower at 2 to 2½ inches for bluegrass, 2 to 3 inches for tall fescue, and 1 inch for warm-season grasses such as Bermuda and zoysia.
Check evapotranspiration (ET) guidelines with your water department. Many lawns can stay partially green at even half of the recommended rates. Adjust watering times according to the seasons.
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.
Water for short intervals. This way, the soil can absorb the moisture without wasteful runoff.
Switch to low-volume sprinklers. These apply water at a rate slow enough for the soil to absorb.
Increase water penetration. Use a power aerator (available in rental yards); this also reduces thatch and runoff.
Reduce irrigation in shady areas. Stretch the time between irrigations.
During drought or water shortages, let the lawn go dry. Many lawn grasses, including Bermuda, tall fescue, and zoysia, will green up when they can be watered again. Otherwise, you can always replant.
Replace difficult-to-water narrow strips of lawn or grass growing on slopes with less thirsty groundcovers. Choices include *Coprosma kirkii* (*Sunset* climate zones 14–17, 21–24); dwarf coyote brush (*Baccharis pilularis*, zones 7–9, 11, 14–24); star jasmine (*Trachelo spermum jasminoides*, zones 8–9, 11, 13–24); and trailing African daisy (*Osteospermum fruticosum*, zones 8–9, 13–24).
Switch to drought-tolerant grass, such as tall fescue or hybrid Bermuda. Or better yet, plant a locally native, low-water grass. Choices vary by region, but might include Pacific hair grass, creeping red fescue, or buffalo grass.



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 dwindles to nothing in midwinter.

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 through easily and don't stick to shoes. Most readily available in and around Oregon's Willamette Valley. Apply 2–3 inches.

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

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.

SHREDDED BARK
Slow to decompose, with a more woodsy, natural look than cut bark. Irregular bits and shredded pieces knit together so it stays in place. Useful on slopes and in windy areas. Apply 2 inches.

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

FROM LEFT: ROB D. BRODMAN, E. SPENCER TOY

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. Compost, 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 108 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 and trees 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 indefinitely. 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 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 week 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 have 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

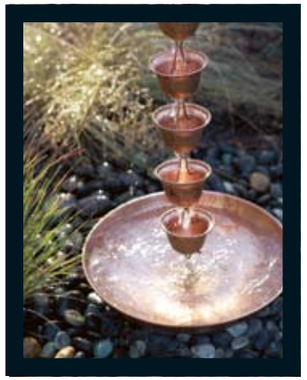
Plant a rain garden

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 at the garden's edge, 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.

DESIGN Malissa Gatton *(inharmony.com)*

CLOCKWISE FROM FAR LEFT: CAMILLE NORDGREN (2), ROB D. BRODMAN, JIM MCCAUSLAND (2)



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 *($169)* 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

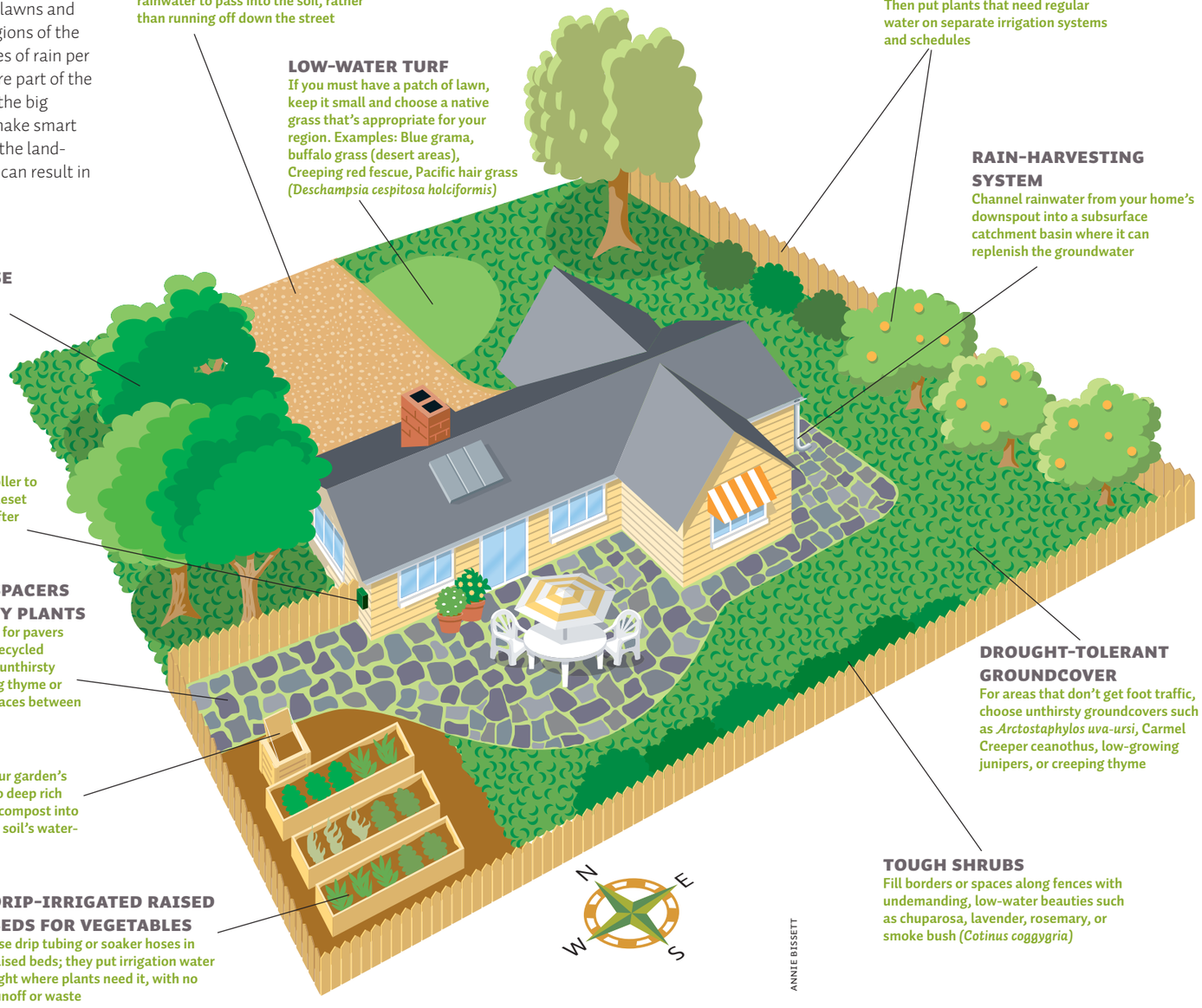
An inch of rain puts about 600 gallons of water atop a 1,000-square-foot house. Rain gutters capture it; from a downspout, you can direct it into a cistern to help water your garden. At Islandwood Environmental Learning Center on Bainbridge Island, Washington, three steel cisterns store rainwater from 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.



ANNIE BISSETT

HOW TO FIGHT DROUGHT

When drought comes, and with it the possibility of local bans on lawn watering or punishing hikes 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 sod, but a 70-foot-tall redwood can take 20 years or more to replace.) Landscape trees such as ash, 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 1-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 10 to 12 inches (check it with a sampling tube), moisten the soil 18 to 24 inches deep.

Coil 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 10 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.

Water landscape plants near lawns Plants growing in or near a well-watered lawn become dependent on that irrigation. If lawn irrigation is abruptly cut off, those plants will suffer and need supplemental water.

Monitor shallow-rooted shrubs On azaleas, rhododendrons, and young camellias, watch for wilting or drooping of new growth. Build basins around them (make sure water won't pool against the trunks), and give them a deep soak in April with clear water (soapy water, on rhododendrons, can cause leaf burn).

Mulch It bears repeating: A layer of mulch helps keep moisture in the soil (see page 26). The best mulches (bark chips, for example) don't compact easily, but allow sufficient air and water to reach plant roots.

Irrigate fruit trees Most stone-fruit trees can survive some 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 wilting, yellowing, or curling leaves.)

Apply water slowly and deeply at the drip line with soaker hoses as described for big trees; or make a basin 4 to 6 inches deep under each tree, extend it to the drip line (3 inches beyond if you can spare more water), and use a hose to fill the basin slowly.

Cover swimming pools A good practice even when water use is unrestricted, covering an unused swimming pool during times of drought is especially important. A pool cover can stop 90 percent of water evaporation waste, even allowing for times when the pool is in use. Many styles and materials are available, including translucent air-cell plastic types, sold at swimming-pool supply stores. To avoid accidents, entirely remove any cover before jumping into the water.