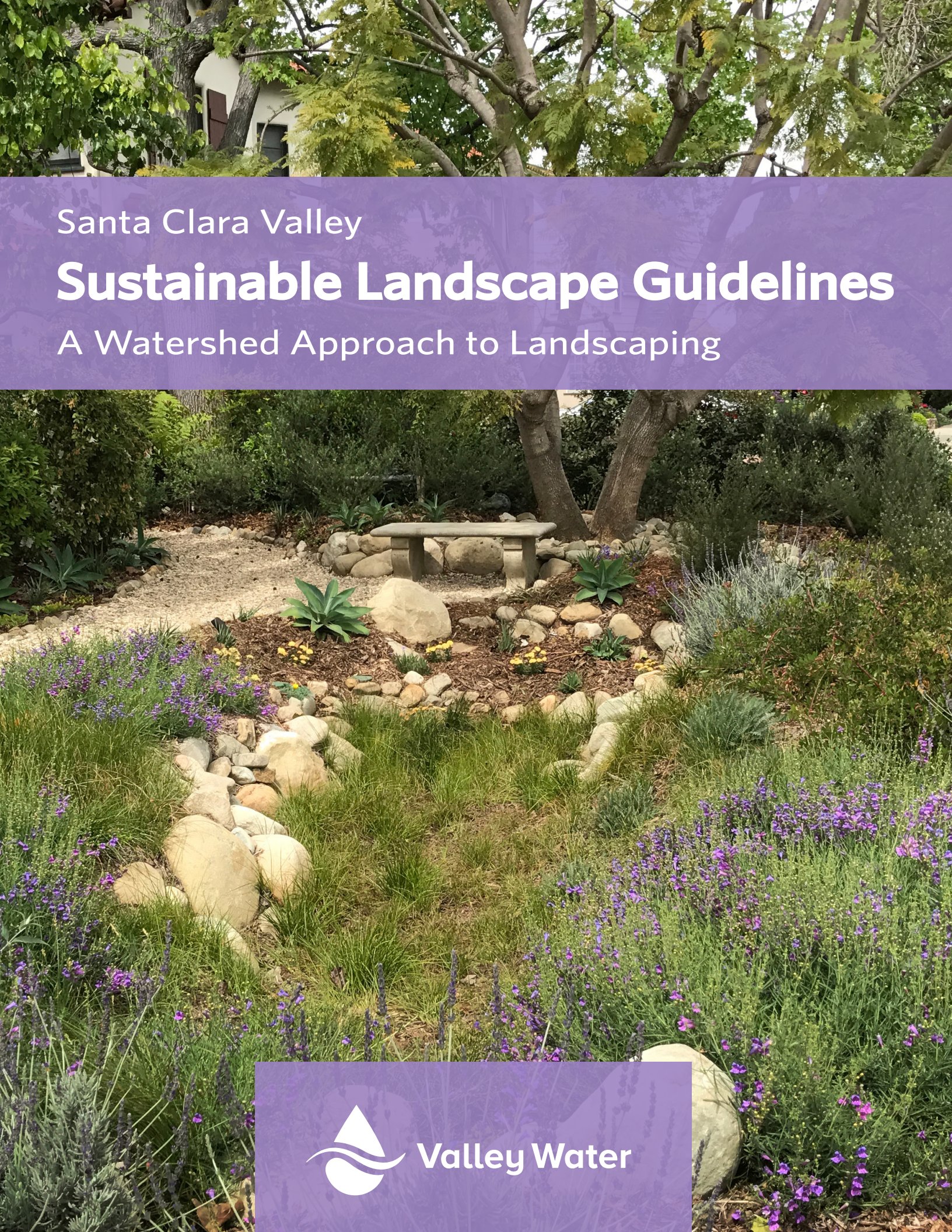




Santa Clara Valley

Sustainable Landscape Guidelines

A Watershed Approach to Landscaping



Valley Water



This Guidebook provides water-wise plants, landscape design tips, gardening how-to, and other resources for Valley Water customers.

The following people are gratefully acknowledged for their energetic contributions to completing this guidebook:

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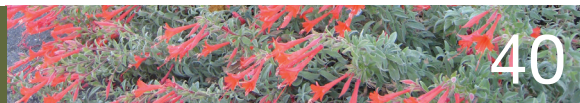
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A New Way to Landscape

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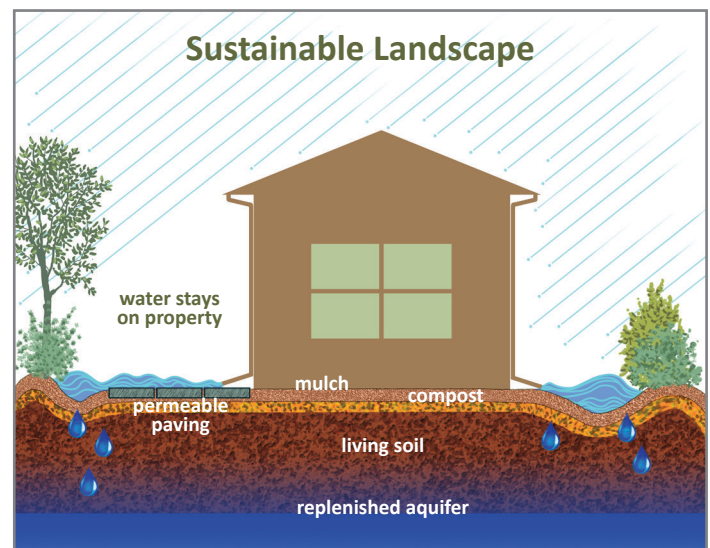
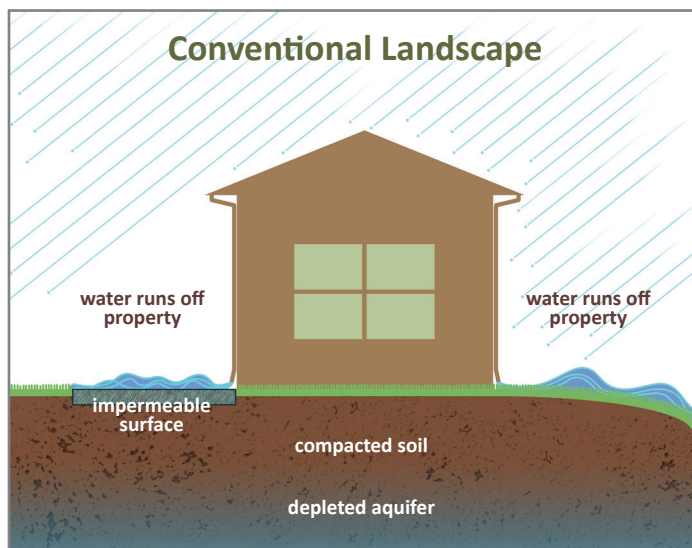
These Beautiful gardens...

require less water, but don't look dry; they are attractive, lush and evergreen because they were created following the principles of the watershed approach to landscaping.

While conventional landscapes allow water to run off the property and often waste water, watershed wise landscapes are designed to hold on to rainwater and reduce the demand for supplemental irrigation. In the pages that follow, you'll see inspirational gardens that allow us to continue enjoying Santa Clara Valley's varied and amazing climate and outdoor lifestyle, while conserving valuable natural resources and creating a diverse habitat of plants and insects.

If we want South Bay landscapes that are truly resilient to the effects of a changing climate, then we need to go beyond sustainable and water wise principles to begin managing each property as though it were a mini-watershed. By paying attention to the design of the garden, building soil and keeping rain on our properties, selecting climate-appropriate plants and managing supplemental irrigation, we transform our landscapes into abundant watershed wise enhancements to our properties and neighborhoods.

Now dig in!



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In Three **Easy Steps**

Healthy **Living Soil** Captures **Rainwater**.



Healthy living soil is made by adding compost to your soil, covering your garden with mulch, and by avoiding soil disturbance as much as possible. Compost boosts soil organisms that reduce diseases and pests. There's no need for adding fertilizers or pesticides on watershed wise gardens.

Maintaining 2"-4" of small-size organic mulch on top of every open space in the landscape keeps the garden looking clean while slowly building the soil. The mulch holds in water, so less irrigation is required (*see p. 18*).

When downspouts are directed to these landscapes, living soil becomes a giant sponge that helps keep plants healthy and happy, whether it's raining or we're in a drought (*see p. 26*).

Climate-appropriate **Plants Reduce Irrigation Needs**.



Selecting climate-appropriate plants like those from Mediterranean climates and, even better, from Santa Clara Valley's own native plant communities, makes your garden automatically adapted to the seasonal summer drought, wet winter months, and various Santa Clara Valley microclimates. Many plants from the five Mediterranean climates, (South Africa, area around the Mediterranean Sea, Chile, Australia, and certain regions of California) are appropriate for our gardens.

Local native plants benefit the local native birds and insect species by providing food and nesting materials! There are many dry-adapted evergreen and long-flowering California native plants. When you use them in your garden, you get year-long interest and a garden filled with life, on reduced summer irrigation (*see pp. 6-7*).

Efficient Irrigation Supplements Rain.



There may be years when there isn't enough winter rain, or you may have plants you love that struggle to thrive in the long, hot, dry summers. In those cases, you want to apply supplemental water through a highly efficient irrigation system.

Efficient irrigation makes sure every drop of water applied to the landscape stays there for the benefit of the plants. By using soil moisture sensors and/or weather-based "smart" irrigation controllers, low flow spray nozzles, rain sensors, and drip irrigation, you can keep your landscape healthy without wasting water (*see pp. 34-35*).

You also can reduce your irrigation use just by paying closer attention to it. Grab a cup of coffee and get to know your irrigation controller!



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Envision Your Sustainable Landscape

A healthy landscape is one that offers both lasting beauty and practical functions . . . season after season. The homeowners whose garden we use in our examples in this handbook want to remove the lawn without using chemicals and replace it with a low maintenance and low water landscape that uses local California native plants to reflect the lush chaparral-covered hillsides and oak savannahs of the Santa Clara Valley. They want to start spending more time in their garden with their family and dog, and attract birds, butterflies, and other beneficial insects. They also want to capture all the rainwater from the roof, even though one downspout puts the water right on the driveway, and keep it in their garden.

Think about the elements of your landscape that are most important to you. Jot down a few ideas that will help you determine your next steps.

Consider how much maintenance you want to take on. Are you ready to lose the lawn? Would you like fruit trees or edible shrubs? Are you falling in love with California native and California friendly plants?

Consider how you move through the garden. Do you have a patio near the house, or out in the yard? Would a nice wide entry pathway make your home more welcoming? Does enclosing the front yard make the most of a small space and provide needed privacy?



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Functionality

Plan your garden with long-term health and maintenance in mind. Look for opportunities to improve the soil with compost and mulch, shape and contour the land to make the most of rainfall, and select climate-appropriate plants that thrive in the local environment. Think about providing resources for local native insects and fauna, and keeping pollution out of rivers.

Aesthetics

The art of garden-making draws from the principles of scale, color, texture, and placement of plants and features. Landscapes are living, dynamic performances, and the long-term health and viability of the garden requires knowledge of the science behind what we see with our eyes. A well-designed landscape will continue to grow, change, surprise, and delight for decades.

User Experience

A well-executed landscape design, whether you do it yourself or have professional help, not only makes your home more enjoyable, it adds to your useable space. Studies have shown that thoughtfully developed outdoor spaces can increase the value of a home by up to twenty percent. And a well-maintained landscape ensures that you retain that value.

Landscape Like a Professional



Scope Your Project

If your budget is limited, you may want to make small improvements first and then bigger changes in a year or two. Working with a professional designer can help you plan these phases. You may start with weed removal and preliminary planting, then add features such as raised vegetable boxes or a rain garden. Plan ahead before you lose the lawn. Like anything, an ounce of prevention is worth a pound of cure. Implementing the basic functionality of the watershed approach does not add to your overall installation budget.

When you invest in your landscaping, you are investing in the long-term value of your property. Don't forget to plan an ongoing maintenance budget allocation for keeping the garden healthy over time (see p. 44). Stretch your dollars by taking advantage of rebates and incentives offered by Valley Water. Visit WaterSavings.org to learn more.

Landscape = Softscape + Hardscape

Softscape includes ground preparation, planting, irrigation, and lighting; hardscape refers to everything that is built. Consider that the landscape is raw ground to be prepared, graded, etc. All of the typical building trades work on a landscape: plumbing, electrical, and if you are installing hardscape or covered structures, expect to include masonry, carpentry, fixtures and appliances. Many people who go DIY can remove turf, make grade changes and build soil through sheet mulching. Planting also can be accomplished using the techniques outlined in this book. The more you do yourself, work with what you have, or select low cost materials, the more affordable you will make your landscape changes.

There is no such thing as a typical budget for landscape design and installation. While a good **RULE OF THUMB** is to budget 5% - 10% of your home's current market value in a landscape renovation, every site is different, and the situations encountered on that site will dramatically influence the overall budget for the project. Location, expectations of the neighborhood, and aesthetics must be combined with all of the functional requirements discussed in this book to inform the final budget for your landscape. When you take into consideration special site circumstances such as slopes or tricky drainage, expect to spend more on design and installation. If you include hardscape, covered structures, or other built amenities like outdoor kitchens and pools, the prices rise exponentially.

Need help getting the job done?

Building a garden is a collaborative experience. If your property has a slope or you live in a landslide or fire-prone zone, you may need to seek the professional advice of a licensed civil engineer, landscape architect, or other professional before grading and capturing rainwater on existing hillsides. Protect your investment by hiring a licensed arborist for your tree care and licensed contractors for installation. Talk to your landscape designer for referrals to other qualified professionals.

Invest in Design



The more time you spend researching your options and planning your garden, the better prepared you will be during construction. Measure twice, dig once! Spend the time yourself, or expect to pay 10% - 20% of your budget on professional design assistance.

Invest in Soil



Soil preparation is the single greatest investment you can make in the long term health and beauty of your garden. Buy your compost in bulk, and expect to spend at least 10% of your budget on building healthy Living Soil (see pp. 18-23).

Invest in Rain



Capturing and holding on to rainfall from the roof and adjacent hard surfaces helps prepare your garden for the long, dry summer and reduces irrigation demand. Expect to spend up to 20% of your budget on labor for grading for rain detention and materials for drainage (see p. 24).

Invest in Stewardship



Plan for the maintenance of your landscape right from the beginning. Select experienced gardeners who are on board with your vision. Expect to see your gardener less frequently for greater periods of time, and expect to pay for regenerative expertise (see pp. 44-45).



Strengthen Your Communities

Plants Live with Their Best Friends.

Left on their own, plants arrange themselves into communities of their friends based on common microclimates and interactions with each other, with insects, birds, and other animals, and with the physical environment. Most communities tend to occur repeatedly in the landscape under similar environmental conditions.

While non-native plants may be equally adapted as native plants to the climate conditions of a particular area, local native plant communities have evolved together and will grow so well together that they will reject “outsiders” and work together to out-compete them. So, we recommend learning something about the Santa Clara County plant communities and selecting plants that like to live together from those lists.

Many of the plants in our region are adapted to the seasonally dry Mediterranean climate. But there are plants which prefer to

gather near the shoreline or creekbed and tolerate significantly wetter conditions. Some plants prefer dry shade, and others are happier out in the sunshine of open space.

The most iconic plant community lives within the shade of California native oaks. The oak trees themselves are extremely drought-adapted and will not tolerate watering of plants beneath them. Coast Live Oaks (*Quercus agrifolia*) grow an extensive system of feeder roots under a litter of leaves, Blue Oaks (*Quercus douglasii*) and Valley Oaks (*Quercus lobata*) lose their leaves during extremely dry summers, so the plants that live with them must be able to tolerate a highly fungal environment. These trees survive in clay soils that hold moisture in the rainy season, but become completely dry during much of the year. The fungal network connects many root systems underground, which enables all the plants in the community to share resources to weather all seasons.

California Oak Woodland

Water Use Code: ● Moderate ● Low ● Very Low



1 *Diplacus aurantiacus*
Bush Monkey Flower



2 *Aesculus californica*
California Buckeye



3 *Sambucus nigra* ssp.
caerulea
Blue Elderberry



4 *Melica californica*
California Melicgrass



5 *Lonicera hispidula* var.
vacillans
Hairy Honeysuckle

California Mixed Evergreen Forest



1 *Heuchera 'Old La Rochette'*
Coral Bells



2 *Frangula californica*
Coffeeberry



3 *Alnus rhombifolia*
White Alder



4 *Berberis aquifolium*
Oregon Grape



5 *Aquilegia formosa*
Western Columbine

Mixed Evergreen Forest plants thrive along watercourses and lakes, and on moist shady hillsides. The atmosphere in these places is often cool, and the native plants here are moderate water use plants. Many of these plants will tolerate winter inundation and heavy, soggy soil conditions. In the garden, these plants do best next to organically maintained lawn areas that receive some limited summer watering.

California Grassland / Meadow



1 *Eschscholzia californica*
California Poppy



2 *Calamagrostis foliosa*
Leafy Reedgrass



3 *Pacific Coast iris*
Pacific Coast Iris Hybrids



4 *Festuca idahoensis*
Idaho Fescue



5 *Sisyrinchium californicum*
Yellow-eyed Grass

Grasslands feature shrubless vegetative groundcover; these can appear either in moist, shady exposures, or in hot dry conditions. Grasses blend easily with a mixture of annual wildflowers, broad-leaved perennial plants, and bulbs. This community is essential for insects, birds, and other wildlife, and is largely deer resistant. In landscapes, these plants require some patience, as they take two or three years to fully establish and become self-sufficient. The meadow plants featured here grow best in open, sunny conditions and on slopes.

California Inland Chaparral



1 *Monardella villosa*
Coyote Mint



2 *Arctostaphylos 'Howard McMinn'*
Manzanita



3 *Cercocarpus betuloides*
Mountain Mahogany



4 *Stipa pulchra*
Purple Needlegrass



5 *Salvia clevelandii*
Cleveland Sage

Chaparral plants have adapted to poor, gravelly soils that do not retain moisture, and often are found on hot dry slopes. Very little leaf litter collects around these plants, and several of these species have small or resinous leaves that help reduce evapotranspiration. Many beautiful flowering natives, which are very drought tolerant and deer resistant, grow in these conditions. In landscapes, these plants need a hot sunny location and good drainage.



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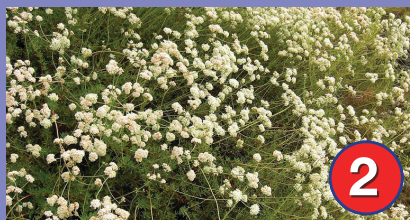
Habitat Corridor Garden

Five Habitat Heroes

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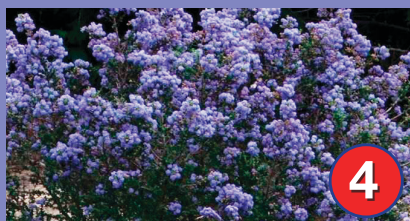
1



2



3



4

© Charlotte Torgovitsky, 2020



5

1 *Verbena lilacina* 'De La Mina'
Purple Cedros Island Verbena

2 *Eriogonum fasciculatum*
California Buckwheat

3 *Diplacus aurantiacus*
Sticky Monkeyflower

4 *Ceanothus* 'Julia Phelps'
Small Leaf Mountain Lilac

5 *Symphyotrichum chilense*
California Aster

Habitat Corridor Style landscapes demonstrate a new paradigm in gardening that views the landscape as a living ecosystem and recognizes the intricate relationships between native plants and the host of native creatures that evolved in associations with those plants. Habitat gardens are designed to provide food, cover, water, and nesting opportunities for wildlife; enhanced conditions that bring fascinating creatures closer to home.

These landscapes help to re-establish corridors between open spaces for wildlife, many already in decline and stressed by human encroachment into wilder lands. Habitat Corridor gardens are an oasis for creatures in areas otherwise dominated by 'green deserts.'



© Pamela Berster, 2020

Homes For Garden Visitors



1

1 Weeping Stone



2

2 Wood or Stone Pile



3

3 Bird Nesting Box

To attract more garden-helpers, native bees, small reptiles, and amphibians, create habitat niches just for them. Consider hanging nesting boxes for songbirds, using dry-stacked stone instead of mortared walls, and leaving a small rock pile. Put a log or large tree branch in the garden and let it decompose naturally.



These habitat gardens embrace biological diversity, ecological design, and environmentally-friendly gardening methods that eliminate the need for additional inputs like fertilizers, herbicides or pesticides. A good planting formula for habitat gardens is 33% California natives, 33% old fashioned ornamentals rich with nectar and pollen, and 33% edible plants (berries, fruits, and herbs).

Plants For Riparian Habitats and Amphibians



1

1 *Cornus sericea*
Creek Dogwood



2

2 *Deschampsia cespitosa*
Tufted Hairgrass



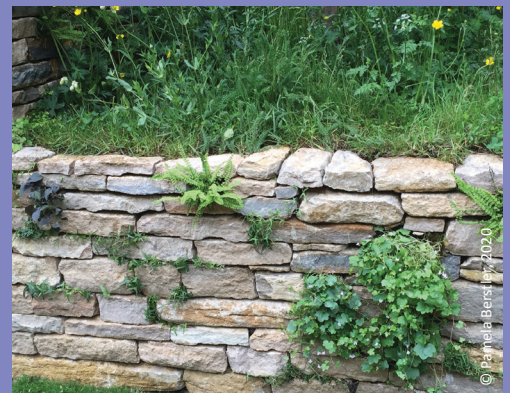
3

3 *Mimulus cardinalis*
Scarlet Monkeyflower

Riparian “creeks and wetlands” habitat is an essential wildlife corridor between habitat patches and otherwise fragmented landscapes. Boggy patches and low spots are best populated by riparian plants that will tolerate soggy conditions and rainy season inundation.

Tips For Habitat Corridor Style Gardens

1. **Celebrate Sense of Place** by recognizing the native plant community that was present before urban development and preserving the native plant species already on site (see pp. 6-7).
2. **Promote Diversity** in the forms of plants (trees, shrubs, vines, perennials, grasses, and annuals) to create vertical layers which provide food, cover and nesting sites.
3. **Avoid Pesticides** and plant for the insects first with a diversity of plants in large drifts that bloom at different seasons.
4. **Leave the Leaves** in place and recycle any organic material on site with compost piles; these provide foraging opportunities for insects and larvae for birds and other small critters. Keep a little section unkempt (away from any structures or trees) and let flowers and grasses go to seed. Be sure to abide by fire safety rules.
5. **Try A Weeping Rock** of rough stone or other simple water source with tiny pools at varying depths. Include a “beach” or partially submerged log to encourage safe and easy access for birds and insects.
6. **Include A “Heat Sink”** and basking opportunity by placing stones and boulders as accents or including a gravel pathway that can heat up areas of the garden. Paired with heat-loving plants, these areas become microclimates that hold humidity and create much-needed cover.
7. **Include Dry-stack Walls** with recycled concrete or stone wherever possible to create nooks and crannies for hiding or over-wintering places for small creatures and insects in their various life stages.
8. **National Wildlife Federation** provides yard signs to people who meet the standards for Habitat Gardens. Get a sign to tell neighbors about the abundance in your landscape. www.nwf.org





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More Trees, Please!

Trees are Priceless

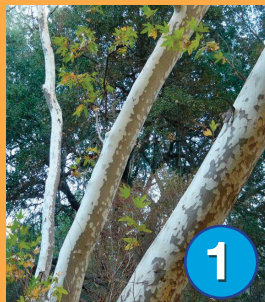
While planting trees means improved water quality, resulting in less runoff and erosion, it's also good for the pocketbook. Because trees provide shade and actively cool the air beneath their canopy through evaporative cooling, properly placing trees around buildings can reduce air conditioning needs by 30%! Trees are living solar powered air conditioners. Healthy, mature trees can be individually worth tens of thousands of dollars each. Consider using graywater for supplemental irrigation during a drought (see pp. 32-33). Protect your investment by hiring licensed arborists to keep your trees healthy and beautiful with annual assessments and pruning only when necessary (see p. 46).

Choose the Right Tree for your space and your needs. Trees are both slow-growing and long lived, so planting a tree is a big investment in both time and money. Consider the mature size of the tree when you plant it. At the nursery it's short and cute,

like a puppy, but a small tree can quickly grow into a 30 foot tall tree with a 30 foot wide canopy of branches, or bigger. If you've selected a large tree species, it can top 70 feet tall and wide at maturity. Select a tree that will best fill the space you have, not one that will need annual pruning to keep it small.

Consider litter and allergen issues - some people are particularly allergic to specific tree species, and some fruit and nuts (olives, persimmons, black walnut, etc.) will stain patios and can make sidewalks slippery. And consider evergreen vs. deciduous species for different spaces. Hot summer patios are perfect places to add leafy deciduous shade trees. Deciduous trees will lose their leaves in winter, making them an even greater choice on cloudy, shorter winter days when the lighter tree canopy will allow more sunlight through. Evergreen trees and shrubs are better for privacy screening and year-round tidiness. When making your tree choices, also consider fruit, flowers and seasonal color.

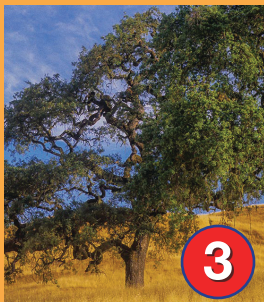
Majestic Landscape Trees



1 *Platanus racemosa*
Western Sycamore



2 *Quercus agrifolia*
Coast Live Oak



3 *Quercus lobata*
Valley Oak

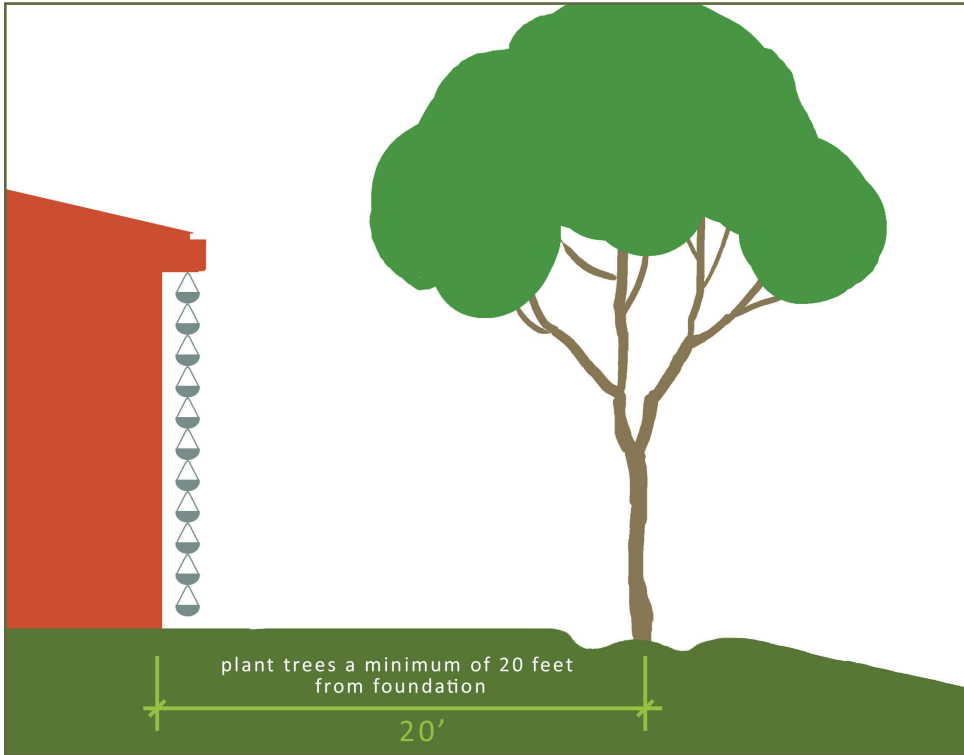


4 *Arbutus 'Marina'*
Marina Strawberry Tree



5 *Lyonothamnus floribundus*
Fernleafed Ironwood

Keep Trees Happy



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Right Tree, Right Place

Place your trees carefully. Make sure the placement of the tree is sufficiently far away from the house. Small trees (30' wide or less) should be no closer than 20 feet. And large trees (70' wide or more) should be planted no closer than 40 feet from the house. Also consider nearby trees, other structures (like power and phone lines), views and where shade will fall at different times of the day, in different seasons.

On the ground, pay attention to water, sewer, septic and other utilities, as well as patios, sidewalks and driveways. If you will be planting near any of these, choose trees with low root-damage potential. If you are in a windy area, near the top of a bluff or hillside for example, select trees with strong branches and small leaves, so wind will easily pass through their canopy and gusts won't topple trees or shear branches off.

Small trees are like living umbrellas, adding dappled shade, habitat and color to smaller planting areas without taking over. Be mindful of water requirements; avoid planting water-fond California redwoods (*Sequoia sempervirens*) in dry oak woodlands. And pay special attention to those oak trees. Native oak trees provide up to 50% of the year-round food needs for native deer. Please leave native oak trees accessible to deer whenever possible.

Perfect Patio Trees



1 *Ceanothus 'Ray Hartman'*
California Lilac



2 *Cercis occidentalis*
Redbud



3 *Chilopsis linearis*
Desert Willow



Protect Roots, Save Trees

Trees depend on their roots for survival. Roots anchor tree trunks and canopies against strong winds and earth movement. They absorb water and nutrients, and connect trees to the soil and plant communities that surround them. Landscape and construction projects can easily damage tree roots, killing trees, unless the roots are respected and protected.

1. Avoid Heavy Construction Equipment near trunks or under tree canopies. Equipment can break branches, compact the soil and damage tree roots.

2. Avoid Poisons like paints, solvents, cleaners, herbicides and other chemicals that can contaminate soil and kill roots, too.

3. Minimize Root Shock when removing existing plant material, especially grass, by keeping the trees well-watered. Many trees will go into shock when water is reduced, so water them regularly during construction and landscape renovation, especially for the first year after turf or other high-water plant material is removed, even if you remove surrounding irrigation.

4. Slow and Deep Watering under the tree canopy is best. Try using tree bags, soaker hoses or in-line drip irrigation.

5. Plan Ahead For Water Management and put trees on their own irrigation hydrozone in renovated landscapes (see p. 36).



Groundcovers and Lawn Alternatives



Consider a **Natural Lawn.**

Grass lawns that are maintained organically and efficiently can offer a cool surface for both active recreation or just hanging out, but most lawns are maintained inefficiently. It's time to rethink using lawn as all-purpose wall-to-wall groundcover carpet.

Your lawn can be turned into a water conserving **Natural Lawn** that needs up to 50% less water than contemporary fescue lawns. To make your lawn more natural, aerate and cast clover seed mixed with worm castings uniformly over the existing lawn area and water thoroughly. No fertilizers or herbicides are needed, as it will grow less vigorously if they are applied. Less frequent mowing every few weeks keeps the lawn at 3"-4" height. Weeding is almost completely unnecessary; we're encouraging little flowers like English Daisies (*Bellis perennis*), Dutch Clover (*Trifolium repens*) and, in low damp spots, Plantain (*Plantago major*).

Walkable Groundcovers are a good alternative to lawn and can be introduced on the edges of lawn to transition to garden areas. If you don't need to walk on it, then groundcovers can be as high as 36" tall and still look like unified green open space (see p.13).

Maintain Your Natural Lawn

Apply ¼" deep layer of good compost or worm castings every fall (September through November). If the compost smells of manure do not use it! It will kill the lawn. Use only well-composted materials or worm castings. There should be no noticeable foul odor and good compost has a pleasant, earthy smell.

Keeping grasses even longer (4"-5") provides habitat for small butterflies whose larvae feed on them. Resist cutting the lawn on a fixed schedule. Allowing the clover and other tiny flowers to grow, ripen and set seed will perpetuate the lawn without any additional over-seeding in the spring or fall. This is the way nature keeps the lawn evergreen and maintenance costs down – the lawn does all the work. If you are mowing frequently, an application of new seed may be required every spring or fall to keep the appearance more uniform.

Ask your lawn care professional about their equipment and insist on a mulching mower, or purchase one to store and use exclusively on your property, keeping other's chemicals, weeds and pests away from your fabulous smart, healthy and beautiful Natural Lawn.

Great Groundcovers



1 *Achillea millefolium*
Yarrow



2 *Phyla nodiflora*
Common Lippia



3 *Arctostaphylos uva ursi*
'Green Supreme'
Creeping Manzanita



© Stephanie Morris, 2020

Walkable Groundcovers



1 *Thymus serpyllum*
Creeping Thyme



2 *Dymondia margareta*
Silver Carpet



3 *Veronica liwanensis*
Turkish Speedwell

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Step Up Your Groundcover Game

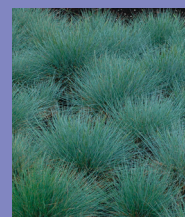
1. **California Native Grasses** can be naturally drought-adapted and provide habitat (food and shelter) for important insect and bird species.

2. **Mow Less Frequently** or not at all to keep the grass from growing too quickly and using more water. Some ornamental grasses don't need to be mowed, and others like to be kept long so the old growth shades the new.

3. **Please Don't Pick The Daisies** nor apply any herbicide to them. English Daisies, Clover, Plantain, and even Dandelion reduce compaction, provide evergreen groundcover and have flowers that feed insects and birds. Cut them back if they get too floppy.

4. **Try New Groundcovers** like the ones in these photos. A. Manzanita (Creeping Manzanita) and B. *Clinopodium douglasii* (Yerba Buena). C. *Correa* 'Dusty Bells' (Australian Fuchsia). D. *Achillea* (Yarrow).

Plants For Tough Spots:



Festuca glauca
Common Blue Fescue



Carex pansa
California Meadow Sedge

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Agrostis pallens
Bent Grass

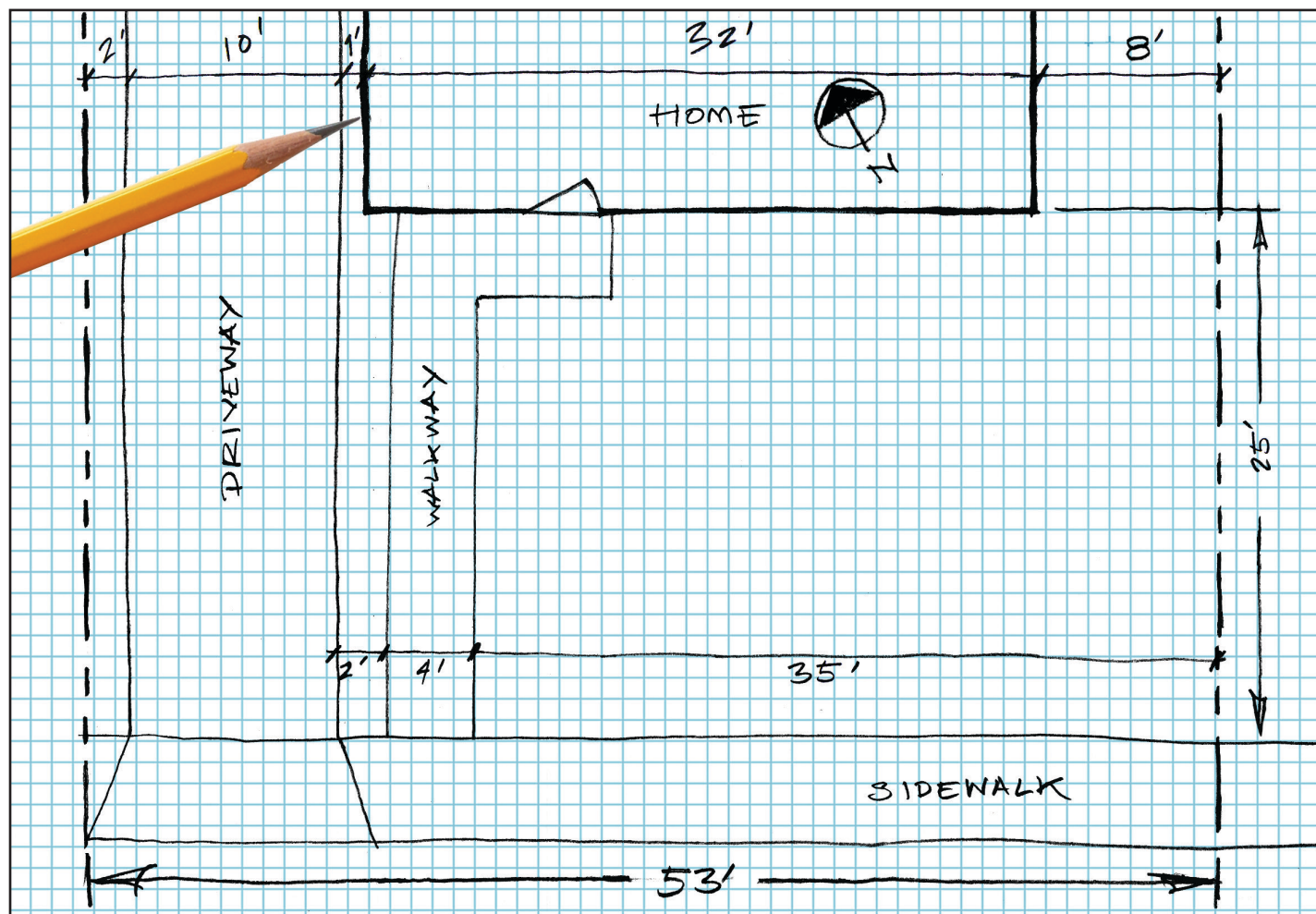


Fragaria chiloensis
Beach Strawberry



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Start with a **Site Plan**



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Measure to Make Your Site Plan

Measure your site. Once you've got the dimensions, trace the lines cleanly on a sheet of grid paper. Make at least 10 copies that are dark enough to still see the grid. You will use each of these sheets to evaluate and plan the changes for each aspect of your landscape.

Depending upon the size of your property, many projects can use a $1/4" = 1'$ scale. Try using 1 box = 1 foot.

Mark the locations of trees and large shrubs you are unlikely to remove. Always use three reference points to triangulate the location of trees. Label any hard surfaces like driveways and walkways.

Take some photos and mark where they are located on your site plan. Use your smartphone or a compass to find north and also mark it on the plan.

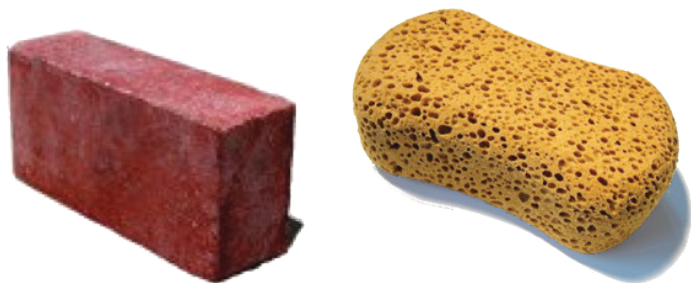
Mind The Foundation

Be sure to mark your doors, windows and footprint of your building on your plans. You will be grading the soil away from foundations and locating your mounded up berms and swales 5' - 10' away from the foundation of the buildings and 3' from edges of the walkways or neighbors.

Need help finding dimensions? [Maps.Google.com](https://www.google.com/maps)

Look at Google Maps for help placing buildings or trees on your property. Just type in your address, zoom in, and use the Satellite view.

Test Your Soil

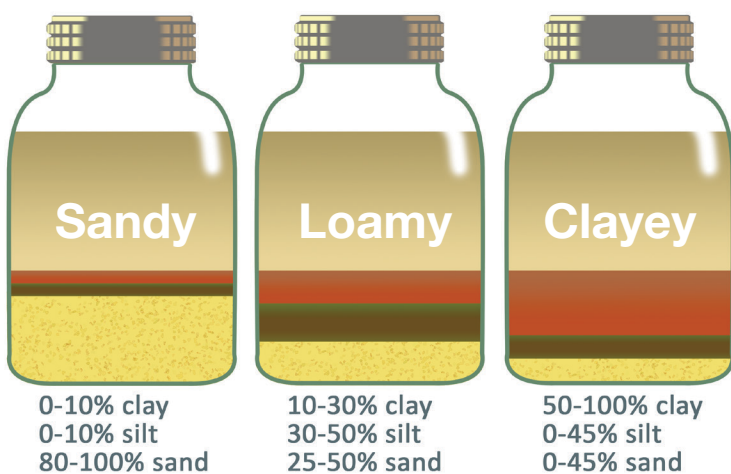


Is Your Soil a Brick or a Sponge?

If you have a brick you will need to take this into consideration when planning your contours. You will need to spend some time and effort to turn the soil back into a sponge. If the soil does not drain well, you will need to take special care when you plant that you do not drown your new plants.

We want to have soil in our landscape that can capture water and allow it to soak into the plant root zone within 24 - 48 hours. Building **healthy soil** therefore becomes important in our plan to capture rainwater and save it for a dry day, so you will need to follow the Soil Lasagna Recipe (see pp. 20-21).

Before we figure out how to grow better soil, we need to figure out what kind of soil we have. Sand, Silt and Clay, are the basic soil types. The smallest particles create Clay soil and the largest make Sandy soil, with Loam (an even blend of Sand, Silt and Clay) considered the "just right" medium. Professional designers will take soil samples and send them off to a lab for recommendations.



Which jar does your sample most look like?

For Example: If there are equal proportions of Sand and Silt, and very little Clay, then the proportions are something like 40% Sand and 40% Silt and 20% Clay.

Loam best describes the jar with 40% Sand, 40% Silt, and 20% Clay.

Your soil is Loam.

Percolation Test

You Will Need:



1. Dig a hole about 12" deep and 12" wide (that's a little larger than a 1 gal. plant container).
2. Fill the hole with water and wait. Note how long it takes to drain completely. This is necessary to completely saturate the soil.
3. Fill the hole all the way when all the water has drained out from first filling, and see how long it takes to drain out again.
4. Lay a stick or shovel handle across the hole and measure the distance from the top of the water to the stick each hour until it has drained completely.

Results:

>4" per hour - You have sand and need to add more organic matter to improve the soil (see p. 23).

<1" per hour - **You have a brick!** Your soil needs some extra help so try sheet mulching (see pp. 20-21).

1" - 4" per hour - Congratulations! Your soil drains well!
You have a sponge!

Determine Soil Type Using A Jar Test

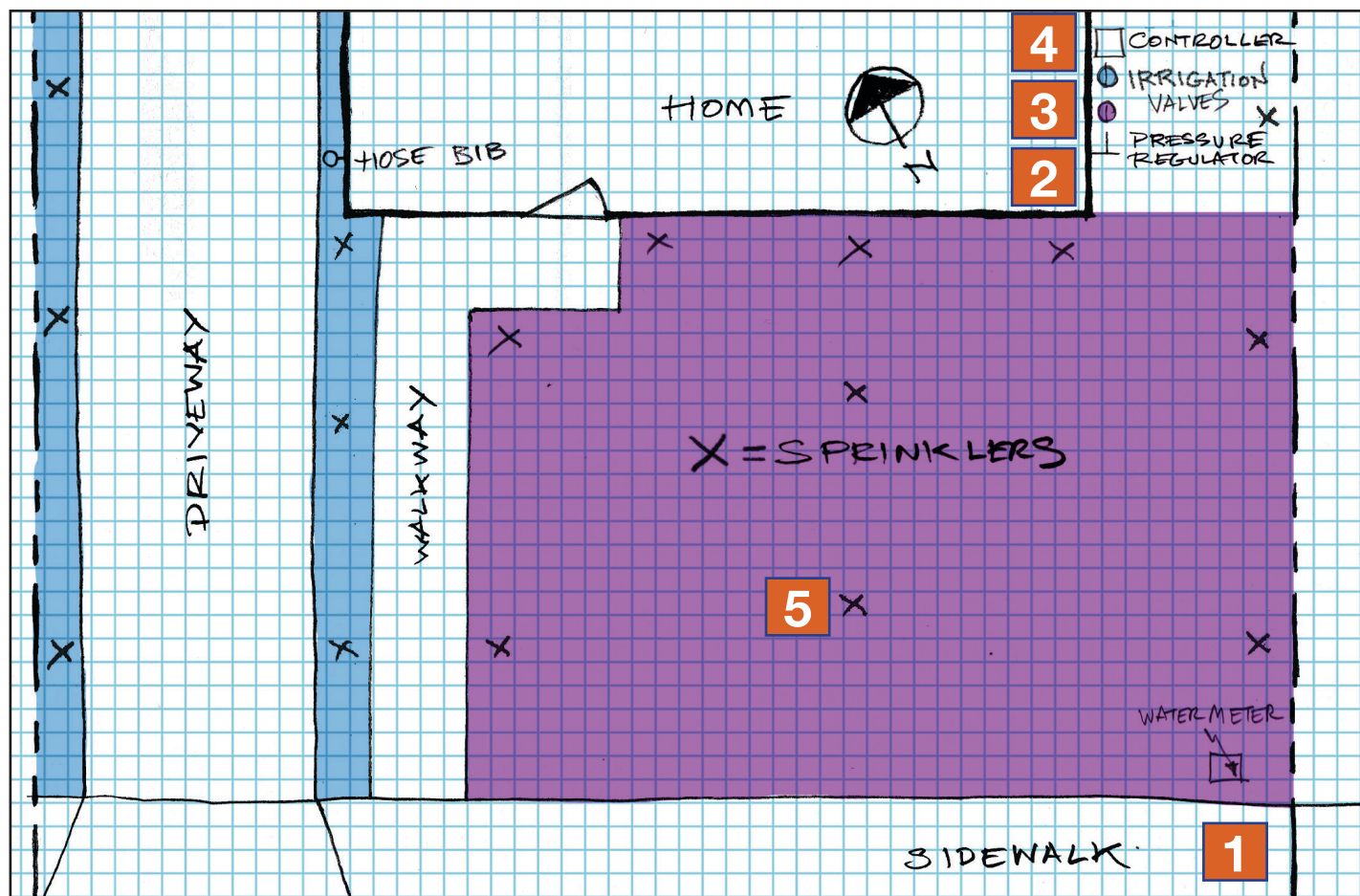
(This is fun to do with kids!)

You Will Need:

- 1 Quart size glass container with lid
 - 1 Cup of soil from the garden (Select one area per container, or take samples from several holes and blend them together.)
 - 1 Teaspoon of alum (Find in baking section of grocery.)
 - 3 Cups of distilled water
1. **Add soil, water, and alum together** in the glass container and shake until all solids are suspended.
 2. **Place container on a shelf** and wait 24 hours.
 3. **Wait another 24 hours**, if the container is still cloudy. After 48 hours, the layers should be settled: **Sand** on the bottom, **Silt** in the middle, and **Clay** on top.
 4. **Measure the layers** in proportion to each other.
 5. **Use the graphic** to determine the Soil Type based on the proportions of Sand, Silt or Clay.

Determine your Soil Type so that you can better program your "smart" irrigation controller and so you can select plants best adapted to your site.

Evaluate Your Existing Irrigation Layout



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Make A Plan of Your Spray Irrigation System

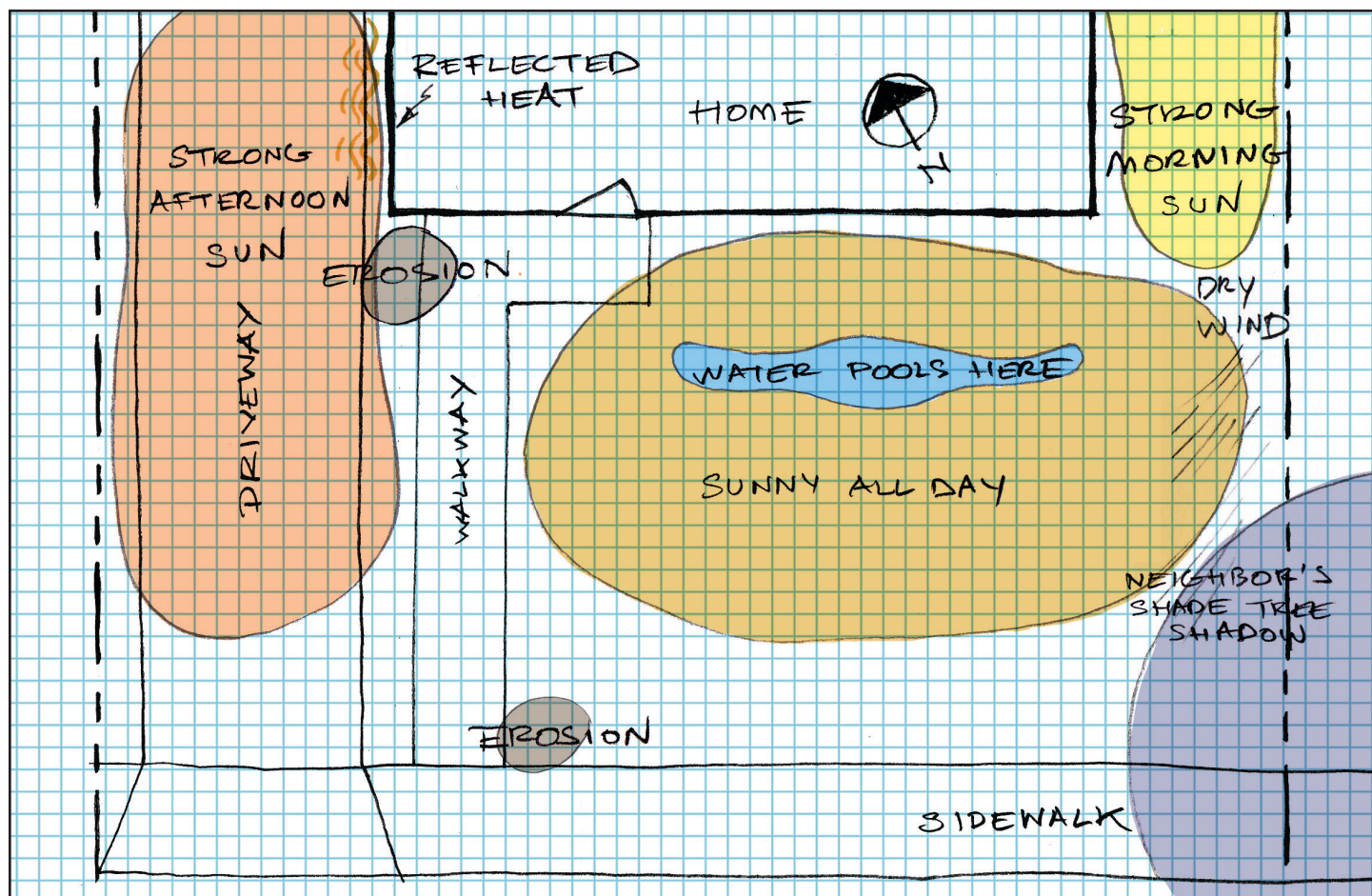
Start the discussion about whether or not to abandon your existing irrigation by mapping out the components of the system. If you have lawn, chances are that your existing irrigation is a spray sprinkler system with an automatic irrigation controller. When converting older spray systems to drip, pressure differentials may damage unseen lateral lines, causing difficulty in finding micro-leaks. **If you are renovating most of your landscape, be prepared to start from scratch rather than try to significantly alter the existing irrigation system.** This way you have an opportunity to use the latest technologies and proper design for your new garden. It is especially difficult to match existing irrigation to new plants grouped by water needs (see p. 36).

Locate all the sprinkler heads on your property and mark their locations on a copy of your Site Plan. Note where the water comes on to your property from the street (the water meter/main line), the location of your irrigation controller, and the location of the valves that control the various irrigation zones. Also, mark the location of hose bibs, shut off valves, and pressure regulators or backflow prevention devices.

Now color code the areas that spray with each valve so you easily can see the various zones you are dealing with for replacing plants and irrigation. Our front yard example (above) has two separate zones marked by two different colors.



Consider Your Microclimates



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Microclimates are **Climate** Factors **Particular** to Your Garden

Every garden has areas where some plants will grow well and others will die. Structures, walls, fences, and other plants all can affect the amount of sun and shade in a garden. And every garden is completely different, even if it is located in the same general climate zone. There will be hills and hollows in your front yard that may collect cold air or, because your property is sloped, you don't get frost when your neighbors do.

Microclimates may differ significantly from the general climate of an area. You need to map these microclimates, and the first step is to walk around your property during the day and observe it more closely. Grab a chair, sit down outside, and start thinking about your design priorities.

Which Plants Will You Keep?

Now is the time to decide which plants will work well in your new garden and which should be removed. Outline the canopy area of each plant you are keeping and note with the name, general size and health of the plant. If you don't know the name of the plant, take a photo and leaf/flower with a bit of stem attached to a local nursery to get some assistance.

Which of these plants seem thirsty and which are not? Many plants can be unthirsty if they are well established, with deep healthy roots (old rose bushes, mature camellias or very large shade trees, for example).

Note Sun and Shade

Mark the areas that receive sun all day and areas that are shaded all or part of the day. Also note which areas receive only partial sun, maybe just a few hours of direct morning sun, mid-day or in late afternoon.

When you start choosing your plants, make sure to select those that are appropriate to your garden's sunlight patterns. Plants marked as "full sun" will not be happy in full shade or vice versa.

Are there other things you observe in your garden? Mark it on your Site Map!

Plants Speak Latin

Did you know that many plants have the same common names? If you ask for a plant by their common name, you might end up with something completely different than what you want. The best way to order plants is to use the Latin botanical name; that way there is no miscommunication.

When you go to the nursery asking for plant identification, be sure to walk away with both the Latin name and the common name, so that you can conduct your research and be assured of selecting the right plant for the right place.



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OWL (Oxygen, Water and Life) makes Living Soil.

Living Soil is alive, and it is essential to a healthy garden. A teaspoon of good garden soil contains annelids, insects and other invertebrates, billions of invisible bacteria, several yards of equally invisible fungal hyphae, several thousand protozoa, and a few dozen beneficial nematodes. Microbes bind soil together and, when **OWL** is balanced, billions of microbes work in concert with the roots of plants to be the change agents that transform brick-like dirt into a healthy, living soil sponge.

Oxygen is needed by healthy plant roots and soil organisms. Healthy soil has lots of little pockets filled with air. When soils are eroded, graded, or disturbed, their structure becomes compacted. Compaction is caused when the tiny air and water bubbles are squeezed out of the soil and the microbes are killed or demobilized. Microbes can be killed by fertilizer and pesticide use or even heavy traffic (foot or vehicular).

Water is needed by both plants and microbes. But too much water in the soil displaces the oxygen, saturating the soil and creating an anaerobic (no oxygen) condition. Pathogenic microbes prefer anaerobic soil, and if this condition persists, diseases may develop, thus endangering the health of your garden.

Water is constantly moving through the soil. Any water in the soil needs to be replenished as the plants use it, as it evaporates from the soil surface, and as gravity pulls it down past the root zone.

Life in the soil includes all the visible creatures, bacteria, protozoa, nematodes, and fungi, the food they eat, the excretions they make, and the root systems they sustain. Adding good organic compost into the soil is the best way to add living microbes and to support the diversity of all other forms of life in your soil.

Plants act like microbe farmers, attracting microbes to their roots by feeding them carbon. Plants know what they need to grow strong and stay healthy, and they can target members of the microbial community with specific compounds in order to get what they need at the exact time they need it. Microbes all need water and oxygen, so they jostle around, creating the miniscule air pockets. Bacteria and fungi hold the soil together with microscopic superglues and binders. Carbon and other nutrients are cycled through these many life forms, creating healthy, living, well-structured soil, no matter what the base soil type.



Use a Soil Probe

A soil probe allows you to determine a lot of information about your soil. It will come in handy when you are trying to figure out whether water is reaching the plant roots or even going too deep beyond the roots' reach.

Press the probe into the ground, twist and pull out to take a sample. Take multiple samples from around your garden. How deep are your plants' roots?

Use this kind of probe on a regular basis if you are maintaining your landscape. It is a quick tool for determining whether or not your irrigation schedule is providing enough water.

Purchase a soil probe online or at your local irrigation warehouse.

Grow a Great Soil Sponge

Try to avoid excessive disturbance of the soil. But, if it happens, make sure you add **Oxygen, Water** and **Life** in the form of really good compost as soon as possible to get the soil critters working again. Good organisms turn dirt into a great living soil **Sponge**.



Eliminate Compaction by Loosening Soil.

If you can press a digging fork into the soil, then all you need to do is make regularly spaced holes around your garden.

If the soil is heavy clay, then augering or tilling may be necessary. Immediately after augering heavily compacted areas, fill the holes with good compost or earthworm castings. Then water the whole thing

thoroughly to get the biological processes kickstarted. Remember that augering and tilling damage the biological network already existing in the soil, so they should be employed only when absolutely necessary. **If you have a lawn, aerating twice a year will help eliminate compaction.**

After decompacting, three essential practices for maintaining soil oxygen are:

- 1) Feed the soil good organic matter from the top down only.
- 2) Plant annuals like sunflowers with jack-hammer root structures to open clay soil.
- 3) Manage water so things don't get too saturated or too dry.



Water Wisely, First with Rainwater.

Rainwater lacks chloramines and is slightly acidic, providing the perfect chemistry for both plants and microbes. Rainwater should be directed into landscapes at every opportunity.

Irrigate only to maintain the water balance in soil (*see p. 38*). Too much water saturates soil and results in the anaerobic conditions that promote diseases. Too little might result in microbes drying up or going to sleep. When microbes are no longer cycling nutrients for the plants, the roots will die and the plant might too.



Add Organic Matter

to improve the water holding capacity of soil. You can get organic matter from a wide variety of sources, including compost and living mulch. Once you get things started, plants manufacture their own soil-building organic matter by dropping leaves, blossoms, and other debris. Mulch, compost and compost tea can be applied to the surface of the soil and used as amendments during planting and soil preparation (*see pp. 22-23*).

Ornamental plants do not need to be fed with fertilizers (even organic ones) if you maintain **OWL**. Fertilizers make the plants lazy about attracting microbes to cycle nutrients; this diminishes the plants' immune response and may compromise their resilience, particularly if they are put under stress from drought or pests.

No Weed Cloth!



It looks like weeds grow right through weed cloth. Weeds are actually encouraged because **OWL** is kept from happening when the organic matter from fallen leaves doesn't touch the soil.

Leaf It in Place



Keep leaf litter and grass clippings on the soil surface, under the plants from which they fall, instead of removing them during maintenance. Be careful not to pile up leaves or mulch against the trunk of the plant.

Go "No Blow"



The last thing plants need is hot, dry air noisily blowing dust around. Stop drying out your garden and use a rake for everything but the largest hardscape areas where an electric blower might be used judiciously.

Tea for Two



Compost tea and worm castings offer a microbe jump start, providing many benefits of compost in an easily-digestible aerated liquid (compost tea) or dry form (worm castings), already teeming with life.



Lose Your Lawn and **Build Healthy Soil**

Sheet Mulching Makes **Soil Lasagna**

We call this lawn removal process **Sheet Mulching**, or **Soil Lasagna**, because we layer materials that living soil organisms eat up and convert to soil. Once you've made the **Soil Lasagna**, all you need to do is keep the system moist so the microbes can stay awake and cooking. How long this will take depends on the kind of grass you have. If you have warm season grass, you will have to cut it out, but you can plant right away. If you have cool season grass, you can leave it in place, but it will be a while before it's ready for you to plant into the yummy soil you are creating.



You Will Need:

Shovels and Rakes
Bins for removed grass and soil
Landscape Flags
Compost, Worm Castings, or Compost Tea

Wheelbarrow(s)
Mulch
Painters' Paper or big sheets or rolls of Recycled Cardboard
Hose with shut off nozzle at end
Water (LOTS!)

Secure Your Permits

Call USA NORTH (8-1-1) two days in advance, and check with your local water agency for any water use restrictions.

Rent a Dumpster

For every 1,000 sq. ft. of turf removed you will need 1 low-boy (10 yard capacity) dumpster. Check with your city to see if turf can be placed in greenwaste pickup.

- 1 After you have checked for permits and any other local restrictions, deal with the lawn you have. If it's cool season, mow it to about 1-2" height, say goodbye and soak it thoroughly with water. Then go to #3. If you want to cut out cool season grass, go to #2.
- 2 If you have warm season grass, rent a sod cutter and remove the grass and 2-3" of roots beneath. The result is that you will be removing up to 6" of grass and soil. Unfortunately, in many cities, this must be hauled away, so you will need to get a permit and rent a dumpster.
- 3 Flag your sprinkler heads so you can find them and cap or convert them to drip irrigation later (see p. 37).



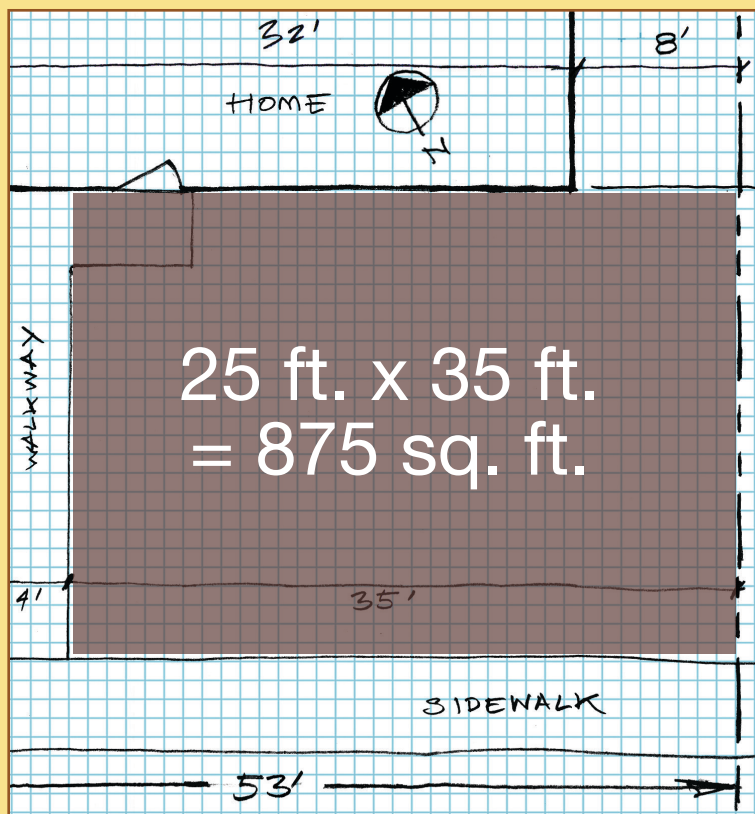
- 4 Dig a trench 8-12" deep (about 1 shovel depth) and at least 10-24" wide (the wider the better) around all hard surfaces and 6" deep along building foundations. **Before moving on, complete your contouring for rainwater absorption and retention** (see p. 29).
- 5 Add a 1" deep layer of compost on top of the graded soil. Alternatively, use humates, a sort of freeze-dried compost available at some landscape supply stores, or spray with compost or worm tea. You are adding good instant food and some beneficial microbes to the soil!
- 6 Water everything well. Wake up microbes, and get the party started!
- 7 Roll out painters' paper, cardboard or other paper. Overlap at the seams by at least 6". No naked soil!



All photos © G3, Green Gardens Group, 2020

- 8 On the hardscape edges, make a "burrito" by A) overlapping the edge of the hardscape by 10" - 12" with paper and covering the trench with mulch, and then B) folding back the paper and covering it with mulch to keep grass from re-sprouting immediately.
- 9 The paper is watered again and add another layer of compost here, if you'd like. Rake a thick blanket 4-6" deep of finely chopped mixed leaf and wood mulch over the paper or compost.
- 10 Water the mulch thoroughly. This mulch layer will absorb more water than you ever thought possible to become soaked through. Don't despair; just keep watering!
- 11 Plant right through the layers. The longer you wait to plant, the tastier the lasagna will be for the new plants, but you can plant right away if you removed the grass. **If you kept your cool season grass in place, count on waiting 3-4 months before planting.**
- 12 Step back and admire your work! Have a glass of lemonade too; you earned it!

How Much **Mulch** Does Your Garden **Need?**



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Add Organic Matter

Add 1-3" of compost to improve the water holding capacity of soil by 30%.

Place 4-6" of mulch on top of the soil to hold in moisture and keep down weeds when planting, and maintain 2-4" of mulch on beds at all times thereafter.

Keep mulch at least 1-6" away from the stems of plants.

Calculate the Material Requirement

Start with the **Square Footage (SF)** of space to be covered and figure out how much you will need for **1 inch of material**.

$SF \times 1 \text{ inch} \div 12" = \text{Cubic Feet (CF)}$ of material needed. (Dividing by 12" turns your inch of amendment into feet of amendment.)

If you need less than 20 CF of material, you can probably make it in a compost pile or purchase it in bags.

If you need more than 25 CF of material, you must convert your materials to Cubic Yards, because you are going to have to have it all delivered in bulk.

$CF \div 27 = \text{Cubic Yards (CY)}$.

So, $25 \text{ CF} \div 27 = \text{about } 1 \text{ CY}$ of material needed.

Calculate the Material Needs for Our Front Yard Site:

$875 \text{ SF} \times 1" \div 12" = 73 \text{ CF}$ for each 1" of mulch.

If you need 2", you multiply the amount needed for one inch by 2 and if you need 6", you multiply the one inch total by 6.

We need 3" of mulch = $73 \text{ CF} \times 3" = 219 \text{ CF}$

For our front yard, that is $219 \text{ CF} \div 27 = \text{about } 8 \text{ CY}$ of mulch. That sounds like a lot of material! It looks like we will have to buy it in bulk (see p. 23).

Avoid These Mulches Around Plants!

While these mulches are commercially available, and some are organic materials, they are not recommended. For example, dyed mulches are composed primarily of recycled wood materials such as treated or painted furniture or wood pallets. Also try to avoid mulches filled with plastic or other debris. Shredded redwood or cedar and rubber present significant fire hazards. Gravel does not decompose to feed the soil microbes and can raise the temperature of the entire landscape.



"gorilla hair"
shredded wood



dyed wood



dyed wood



gravel



rubber

Keep Adding **Compost** and **Mulch**



Compost is a Soil Amendment.

Compost looks like soil. You cannot tell what it once was. That is because it is food scraps, landscape debris and/or manure from livestock, or biosolids (human manure) and other organic matter that already has been mostly consumed and completely decomposed by microorganisms. Good compost brings oxygen, water and life in one package.

How to Use Compost. Compost can be store-bought or homemade. When compost looks like soil, it can be worked directly into the soil. The more coarse or visible the bits of the compost are, the more likely it is to be used as mulch on top of the soil rather than as an incorporated amendment.

Compost works its magic in several ways. First, the compost itself contains particles that improve soil structure. Next, as compost decomposes in soil it encourages microbes to start the formation of healthy soil aggregates. These resulting aggregates are composed of existing soil particles and decomposed organic matter, which combine to create a more stable and better functioning soil structure like a sponge.

Mulch is a Soil Topping.

Mulch may be organic or inorganic material that covers soil and looks like the recycled debris that it is. Mulch can be made from organic debris (not-quite-completely-decomposed compost, grass clippings, leaf litter, and shredded wood trimmings) or inorganic materials such as gravel or decomposed granite.

Mulch protects soil and plant roots from temperature change, keeps moisture in by slowing evaporation from the surface of the soil and keeps weeds from sprouting by reducing sunlight penetration to the soil surface.

How to Use Mulch. Mulch always stays on top of the soil, and is never worked in. Recycled organic debris is the most effective type of mulch, because it builds soil structure over time and provides a durable, protective surface barrier. The smaller the debris and the more mixed leaves with wood chips, the faster it decomposes. When building soil, small and mixed is best. Don't bother with inorganic mulches like rubber, gravel, or decomposed granite in planted areas. These are only applicable in pathways or gathering areas; they don't help grow good soil.

Need Help Buying Amendment?

Sccgov.org/Sites/Rwr/Hc/Pages/Purchase-compost.aspx

MAKE IT

Less than 5 Cubic Feet



BUY IT IN BAGS

Between 5 and 25 Cubic Feet



BUY IT IN BULK

More than 25 Cubic Feet or 1 Cubic Yard



Slow, Spread, Sink and Store It

© Tom Rau, 2020

Five Great Permeable Hardscapes



1



2



3



4



5

1 Sand set pavers

2 Porous concrete paving

3 Interlocking pavers

4 Gravel

5 Cut 3"-6" gaps into existing concrete surfaces

photos 1-3: © Pamela Berstler, 2020 photo 5: © Stout Design Build, 2020

Slow It! Replace downspouts with rainchains to slow down the water, so it is more easily absorbed when it reaches landscaped areas. Add a rain barrel or cistern at the bottom of the downspout or rainchain and direct it to overflow into the garden.

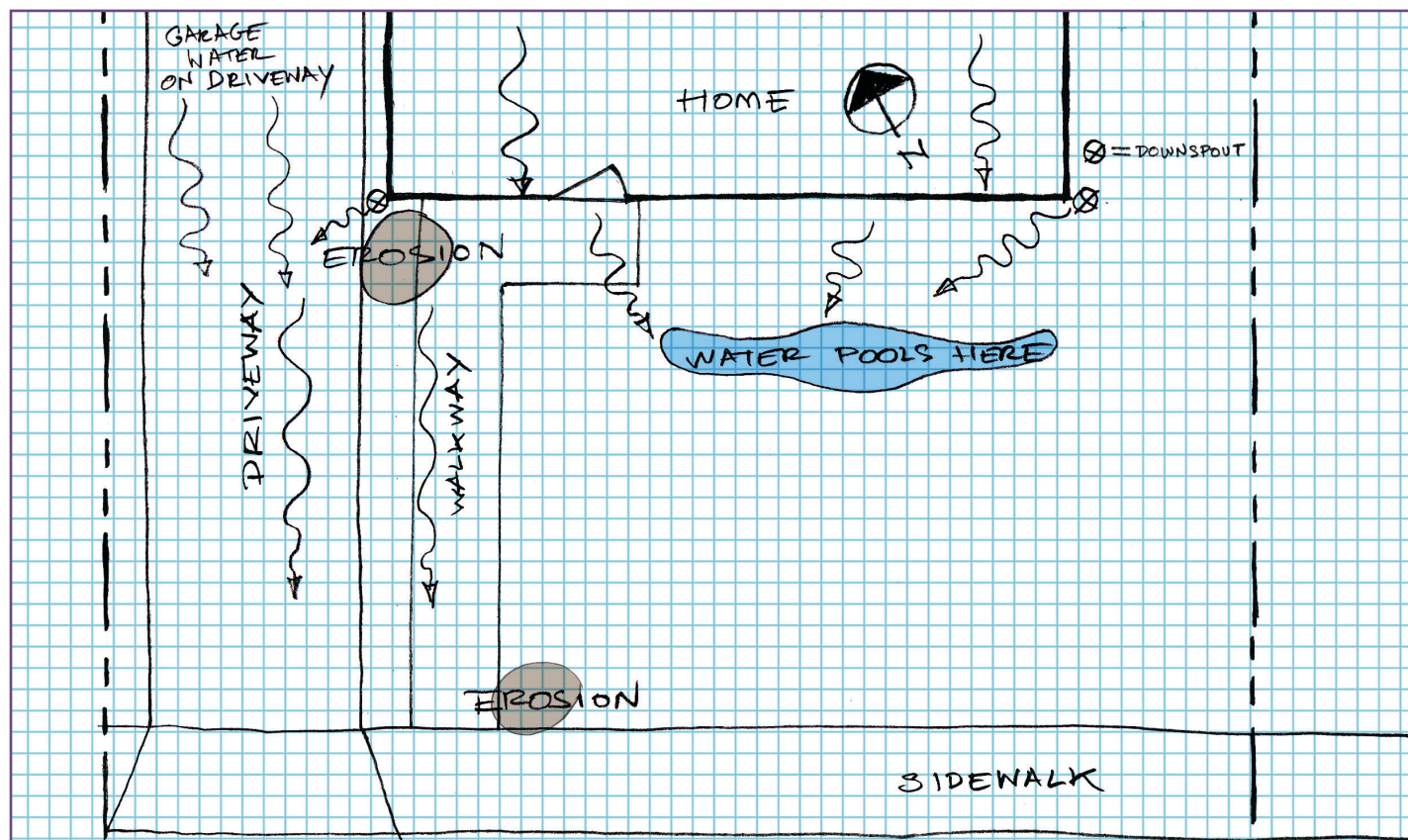
Don't Have Gutters? Cover areas under eaves with permeable groundcover such as pea gravel, mulch, or rock to reduce the compacting force of water falling on bare soil. Spreading fresh leaf and wood chip mulch throughout the garden will slow down water. Healthy soil, bound together by the structures its life creates, can withstand even the strongest rains.

Spread It! Water needs to be spread around to spend some time in your landscape. For new construction, always specify permeable hardscape. Consider breaking or cutting up impervious surfaces like patios and walkways and rearranging the concrete with gaps between the concrete or puncturing it to create planting areas. Paved area drains also can be redirected from storm drains into the garden.

Sink It! Trust the soil sponge to do its job. Large, existing impermeable surfaces (e.g. rooftops) that cannot be transformed should be treated as water capture areas, where water is collected before it is guided to the garden. If you are not able to capture and hold the water on site, then concentrate on making sure that it passes through as much of the natural landscape as possible before it moves off your yard and becomes runoff.

Store It! Rainwater also can be directly harvested and stored. Storage vessels include rain barrels and cisterns directly connected to downspouts. Stored water gradually can be released into the landscape between winter rains. Properly sited trees are an excellent landscape feature for holding rain temporarily and allowing it to be released slowly over time.

Imagine Your Yard is a **Mini-Watershed**



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Your **Roof** is the **TOP** of the Watershed.

Make a Copy of Your Site Plan and Label It "Water Plan"

Watch what happens to water as it comes off the roof of your home and moves across your property. Your roof is the **Top** of your mini-watershed and where the water finally runs off your property is the **Bottom**. Think about how you can capture water in between the top and bottom of your landscape.

Begin to separate out each area that deposits water into a downspout. Mark the location of each of your roof gutters and downspouts.

Once you know the total area of the roof, you can figure out the amount of rainfall that it generates (see p. 28).

- Do you have low spots in which water pools?
- Does water run off the property anywhere?
- Does water run onto the property from a neighbor or street?
- Do any buildings or any hard surfaces appear to be water damaged or eroded? If so, does it appear to be a result of rain, irrigation, or both?
- Note the direction of water as it moves around the property.
- Turn on the irrigation for no more than 5 minutes and note whether there is pooling or runoff.
- What parts of the roof divert water into downspouts, and is the water being diverted into your landscape? Indicate the direction of the water with arrows as seen above.



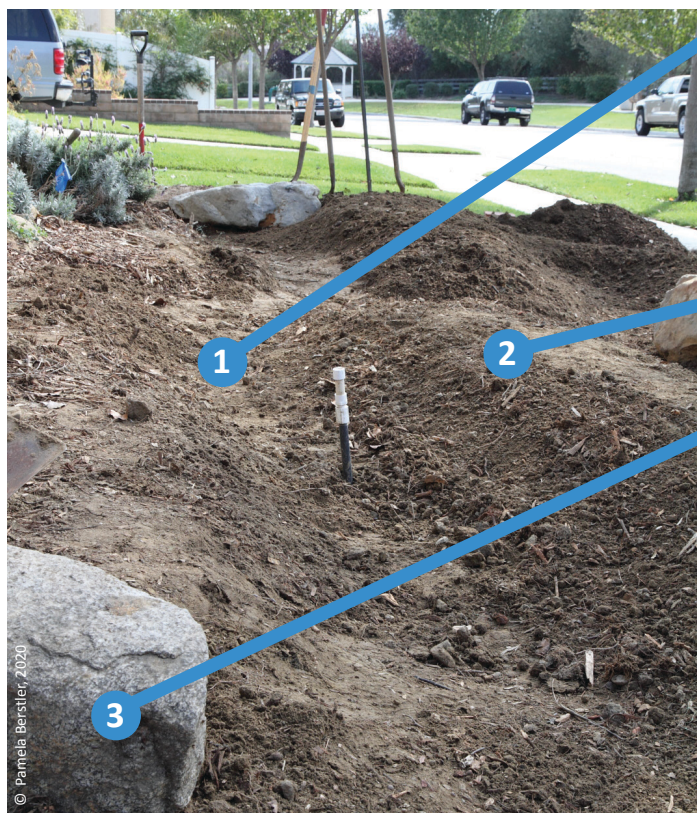


Contours for Rain Capture

Every Garden Can Become a Sponge

Many front yards are just flat lawn, but this space could be a last chance to capture and filter your seasonal rain before it runs into the storm drain and right into creeks, rivers and eventually, the ocean! By contouring the land to hold on to at least the first inch of rain after a dry period (known as First Flush), we create landscapes that are far more interesting than flat expanses of lawn, and provide an opportunity to create conditions for some of California's most interesting native plants.

Meet your **Contour** (aka Swale!) Sounds fancy, but really it's very simple. Your Contour is just a little soil basin to slow, spread, and sink the first inch of rain water from your roof into the plants in your front yard (*see pp. 28-29*). Direct your downspouts into the depression. Your soil and plants will thank you! There are two main components of this watershed wise landscape: **Basins & Berms**. **Boulders** are optional, and a lot of people like the look of them. If you don't like the rock, skip them and just add mulch.



Basins and Swales are shallow depressions, or channels no more than 6"-24" deep, on gently sloped or nearly flat landscapes that move water around over short distances. The plants in and around the depressions capture and sink small volumes of surface water. Small, shallow depressions (6"-12") are best used in clay soil areas, while sandy soils may accommodate the deeper (up to 24") depressions. Channels can be filled with mulch, planted (vegetated swales), and/or lined with rocks and small boulders to resemble natural water features.

Berms are mounds of raised soil, usually planted, that can border basins and swales or be used alone. Berms help contain and move water around, increasing the holding capacity of basins and swales, and providing good drainage for certain plants.

Boulders may be used to retain small berms or edges of swales and to create "dry creekbed" interest in the landscape.



No Flat Yards

Native Plants OK With Wet Feet (Basin Swale Plants)



1 *Anemopsis californica*
Yerba Mansa



2 *Juncus patens*
California Wiregrass



3 *Clinopodium douglasii*
Yerba Buena

Swale Plants Are Special. These basin plants like wet feet and can be completely submerged in rainwater and still survive Santa Clara Valley's hot dry summers without extra water. They're sort of plant Super Heroes that way! Look to the Riparian and Mixed Evergreen Forest plant communities for these selections (see p.7).

Native Plants That Prefer Dry Feet (Berm Plants)



1 *Epilobium canum*
'Everett's Choice'
Everett's California Fuchsia



2 *Salvia leucophylla*
'Point Sal Spreader'
Point Sal Purple Sage



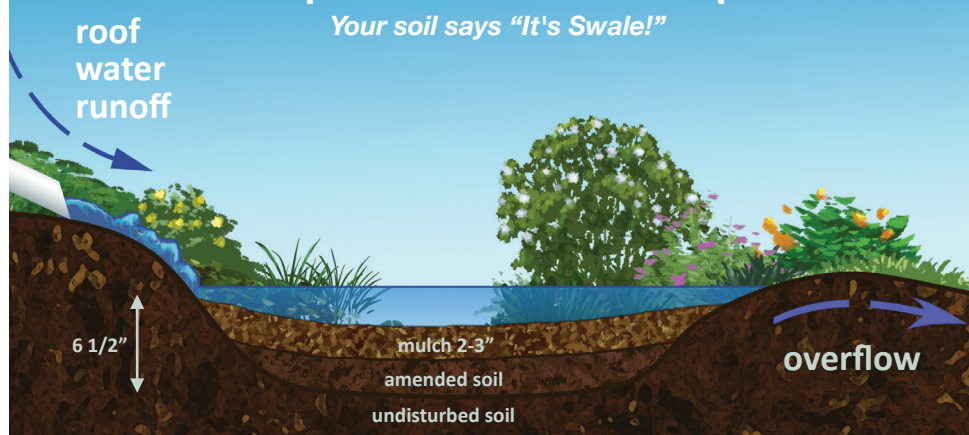
3 *Bouteloua gracilis*
'Blonde Ambition'
Blonde Ambition Blue Grama

Berm Plants Like It Dry. On the mounded side berms, choose plants that like their feet drier. Plants from the Inland Chaparral community are great choices here (see p.7). Throughout the entire landscape, make sure to mulch at least 2-4" deep around all the plants (though not right up against the trunks), including those in the bottom of the swale.

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Simple Rain Garden Recipe

Your soil says "It's Swale!"



Contour Your Garden In Six Easy Steps

1. Make Your Site Plan and note where rain falls and flows. Look for an open, mostly flat low spot to direct water towards in the front yard, or anywhere with the center at least 10' away from the house foundation and 3' away from the sidewalk and neighbors (see p. 25).

2. Lay Out Your Low Spots. Spread out a garden hose to outline the shape. The area must be basically flat or slightly bowl-like, and not sloping back toward the house. Be careful around trees. Don't put your contours under a mature tree or disturb any big roots. Remove all plants (including grass) from the area and start digging.

Do not dig without calling USA NORTH 8-1-1!

3. Do A Percolation Test. If you have compaction, try to break through it with a shovel or a pitchfork (see p. 15).

4. Dig A Basin that is between 6" and 12" deep at the center. Slope the sides gently to make a sloping bowl, not a cylinder. Mound extra soil around the bowl to increase capacity. At the bottom of the basin, put down at least an inch of high quality compost or worm castings to activate your soil.

5. Direct Downspouts Into The Basin area, moving the rainwater through gravel lined ditches or below-ground drainage pipes. Also, make an overflow path so extra water has a direct channel away from your house.

6. Plan For Overflow that isn't directed onto your neighbor's property; overflow always should be directed from your property into the street.

7. The Basin Will Fill Up when it rains, creating a temporary pond until the water soaks into your soil. All the water should be gone in 24 hours.

TAKE ACTION if your basin is slow draining!

If water in your basin is not gone within 48 to 72 hours maximum, then auger the basin to eliminate compaction. Add worm castings when it has drained. Whenever you disturb the soil, be sure to reapply compost.

Capture **First Flush**

First Flush is the **First Inch of Rain** After a Dry Spell.

This is the most important water to capture in your landscape. The first rainfall washes away pollution that has gathered on hard surfaces during the dry spell, and it needs to be filtered by the living soil and root zones of plants before it goes anywhere else.

Calculate How Much Water Comes Off Your Roof

The shape of your roof doesn't matter in the calculation of water it produces. A pitched roof and a flat roof have the same footprint and the same amount of rain falls on the total roof area. Just measure the outside edges (the footprint) and calculate the square footage as you would any landscape area.

Area of a Rectangle = length of side A x length of side B

Some roofs are flat, and therefore easy to calculate. For complicated roofs, divide the area into squares and add up the area of each square.

Once you know the total area of the roof, you can figure out the amount of rainfall that it generates in gallons. 0.62 is a constant that converts square foot inches into gallons.

Rainfall (in Inches) x Roof Area Square Feet x 0.62 = Gallons of Rain Water From Your Roof

You can use these calculations to determine how much water comes off any hard surface (patio, driveway, sidewalk, etc.).



How Much Water per Downspout?

First figure out how much water is coming from the whole roof, and then divide the roof into sections and calculate the particular amounts falling from each downspout:

Rainfall (in Inches) x Roof Area Square Feet x 0.62 = Gallons of Rain Water From Your Roof

If your roof is 1,000 square feet (SF), here's how much water runs off it:

- 1" (rainfall) x 1,000 SF x 0.62 = 620 gallons
- 19" (typical SC Valley total rainfall) x 1,000 SF x 0.62 = 11,780 gallons
- 50" (typical foothills total rainfall) x 1,000 SF x 0.62 = 31,000 gallons

It adds up quickly, even in dry areas. Try to save as much as you can in your landscape sponge!

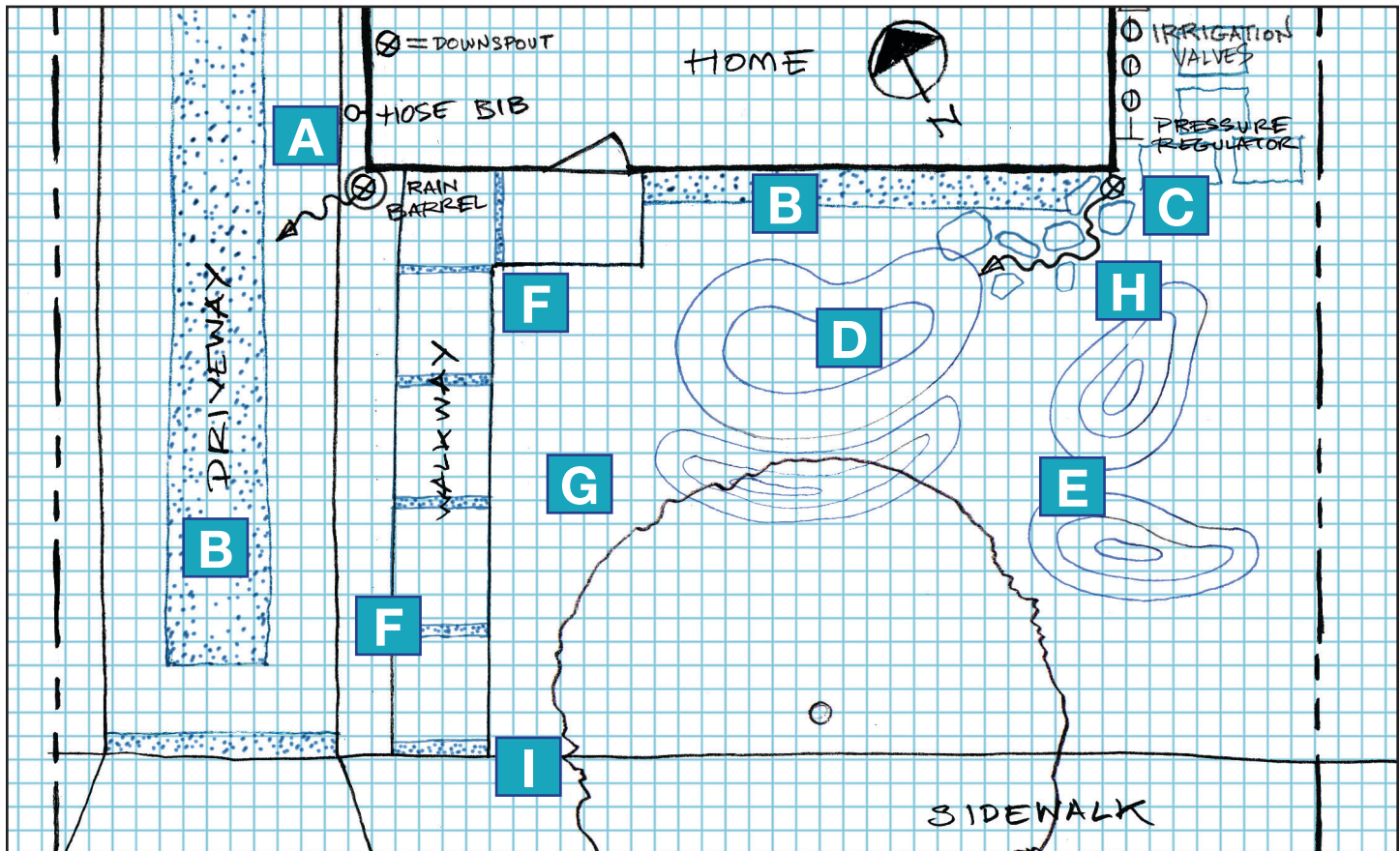
Imagine the water from your garage roof splits into two downspouts and Your Total Roof Area is 20' x 50' = 1,000 SF

If half of the water goes into each downspout, then the roof size for one downspout is: 1,000 SF ÷ 2 = 500 SF

Now calculate how much water that is in gallons from each inch of rain coming from one downspout:

1" x 500 SF x 0.62 = 310 gallons of water per inch of rain per downspout.

Swales are Swell



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- A Downspout Redirected Into Rainbarrel** and away from the foundation of the residence. Overflow from rainbarrel slows down into gravel in the middle of driveway.
- B Concrete Removed and Gravel Installed** in middle of driveway and across the front of the residence. The 18" wide gravel area reduces erosion under roofline.
- C Downspout Diverted Into A Catchbasin** which is connected by perforated pipe into the swale area of the landscape. This should eliminate the pooling and erosion caused by the downspout.
- D A Slight Depression**, or swale, has been dug out in the middle of the yard in the area where water always pooled. This swale is only 12" deep in the middle (see p. 26).
- E Relocate Soil As Berms** when digging out the swale and the driveway area. Relocated soil becomes raised or mounded areas (berms) on either side of the depressed area. The berms become places for plants that like fast drainage (see p. 26).
- F Horizontal 3"-6" Cuts** have been made in the walkway and across the end of the driveway and filled with 1/4" - 1/2" crushed gravel.
- G Living Soil** is being created with Sheet Mulching using 4" - 6" of mixed leaf and bark tree trimmings covering the whole yard (see p. 20-21).
- H Stones And Boulders**, most typically no more than 12" - 18" in diameter, are used to retain the edges of the swale and provide visual interest in the landscape (see p. 26).
- I Overflow** of excessive rain should be directed through the garden and out to the street, not on to neighboring properties.

Images © Pamela Berstler, 2020



Rainbarrel with overflow into planter or permeable driveway



Driveway middle section replaced with gravel



Downspout diverted into swale area through catchbasin and perforated pipe



Horizontal 3"-6" cuts in walkway and driveway

How Much Water Does Your Garden Need?

Evapotranspiration (ET) is the Key to Watering Plants.

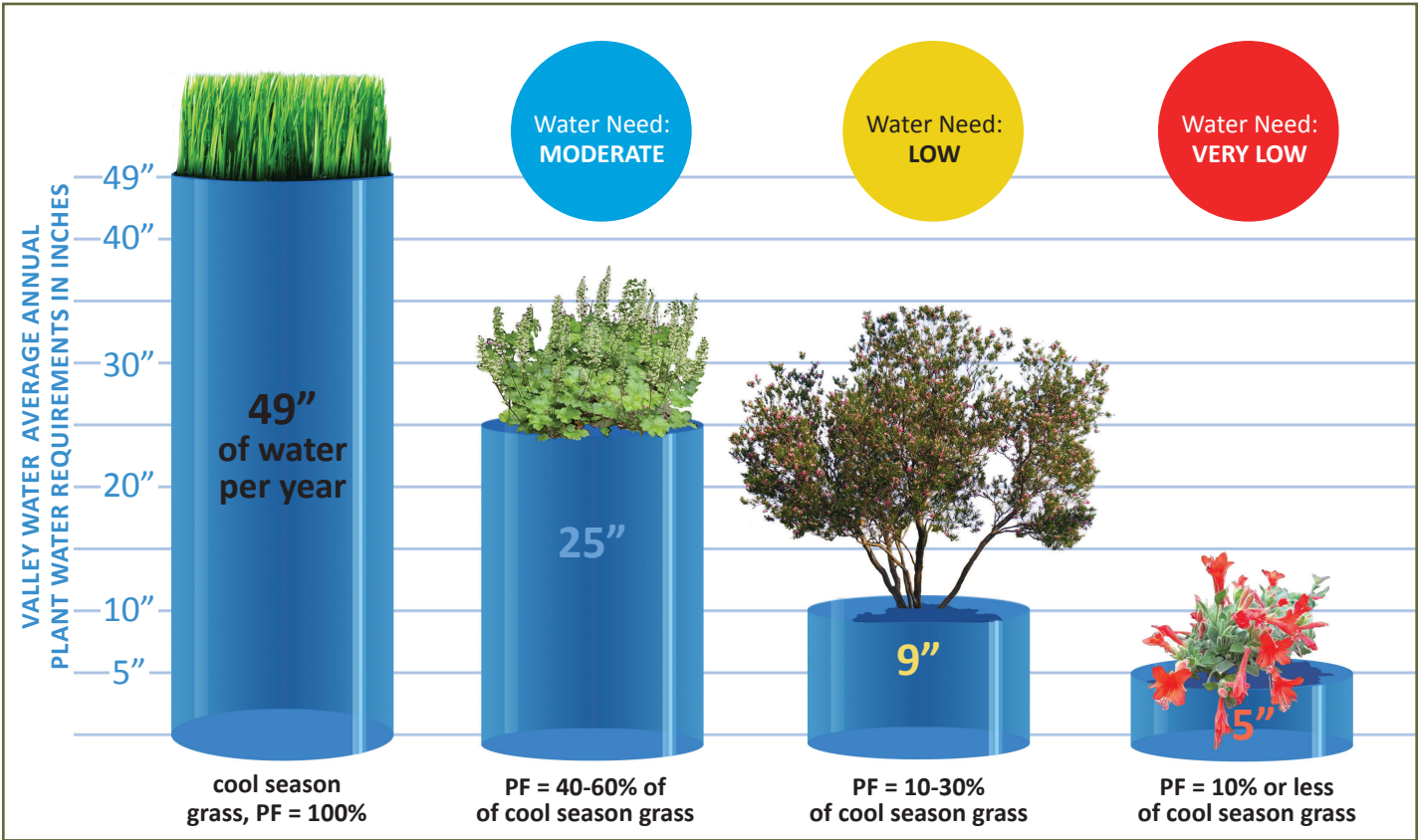
Evapotranspiration (ET) can be thought of as “reverse rain.” ET measures the inches of water being transferred over some period of time from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration (sweat) from plants. ET is a quick way to explain environmental and climate conditions, especially solar radiation (sunshine or cloud cover). Many plants need more water in the summer, when the sun is high and days are long; winter days are shorter and often rainy or overcast, so many plants need less water.

ET therefore, explains how much water plants really need and when they need it; critical information for planning irrigation and managing the **Soil Moisture Account** (see p. 38).

Plant Factor (PF) describes the specific water need of each plant in your landscape. PF can be determined by gathering information about a plant and then comparing it to the amount of water needed by cool season grass growing in your climate zone. PF is expressed as a percentage of the water needed by cool season grass. Plant watering needs, include: **VERY LOW at 10%, LOW at 20%, MODERATE at 50%** and **HIGH at 100%** (cool season grass). This information can be found at CIMIS.water.ca.gov.

Landscape Water Need takes into consideration the effects of irrigation efficiency (IE Percentage) and square feet of landscaped area (SF) to figure out how many gallons of water a particular landscape would require, given its climate zone (ET Inches) and plant selection (PF Percentage).

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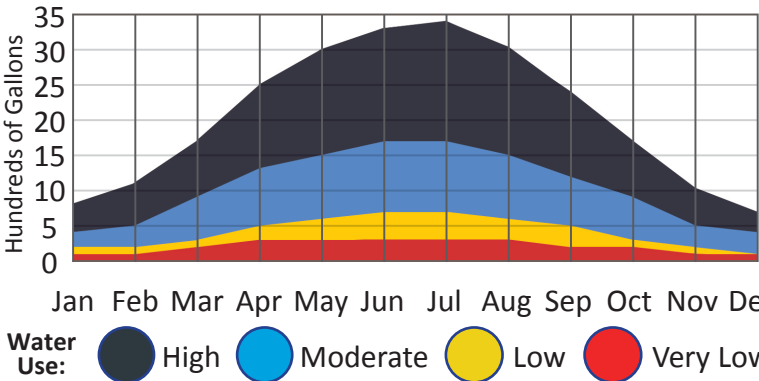
Reduce Landscape Water Need: Understand ET, PF and IE

Every plant choice gives us the opportunity to reduce the Landscape Water Need.

In our 875 SF Front Yard, replacing **HIGH Plant Factor** cool season grass with **VERY LOW Plant Factor**, climate-appropriate plants saves about 34,000 gallons of water annually, without changing irrigation efficiency (see p. 31).

Converting to drip irrigation with a higher IE saves even more (up to 20%)!

875 SF Landscape Water Need By Plant Factor



How Much **Water Can** Your New Garden **Save?**

Calculate Your Landscape Watering Need in Gallons.

Our Front Yard Landscape Water Need:

Our front yard is 875 Square Feet (Landscape SF). In order to calculate the Landscape Water Need, we will keep climate zone (ET Inches) and irrigation efficiency (IE Percentage) constant, but change the plant selections (PF Percentage). See how much water could be saved every year by switching from cool season grass and replacing the area with climate-appropriate **MODERATE**, **LOW**, or **VERY LOW** water requirement plants.

Landscape SF = 875 Annual ET Inches = 49" Irrigation Efficiency % = 70%

Landscape SF x ET Inches x Plant Factor % ÷ Irrigation Efficiency % x 0.62 = Landscape Water Need in Gallons

Grass
Water Need:
HIGH

HIGH Water Need
Plant Factor = 100% = 1.0

$875 \text{ SF} \times 49" \times 1.0 \div 0.70 \times 0.62 =$
37,975 Gallons Annually

New Front Yard
Water Need:
MODERATE

MODERATE Water Need
Plant Factor = 50% = 0.50

$875 \text{ SF} \times 49" \times 0.50 \div 0.70 \times 0.62 =$
18,988 Gallons Annually

In our 875 SF Front Yard, replacing cool season grass with **MODERATE** climate-appropriate plants saves 18,987 gallons of water annually, without changing irrigation efficiency (see p.39). That's a 50% savings compared with cool season grass!



LOW Water Need Plant Factor = 20% = 0.20

$875 \text{ SF} \times 49" \times 0.20 \div 0.70 \times 0.62 =$
7,595 Gallons Annually

Replacing cool season grass with **LOW** Water Need plants saves 30,380 gallons of water annually, without changing irrigation. Change irrigation to drip with IE= 90% and save 32,068 gallons annually. Save 80% compared with cool season grass.

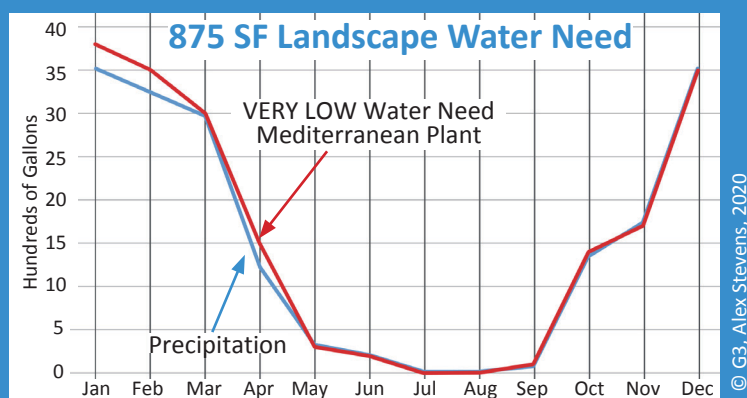
VERY LOW Water Need Plant Factor = 10% = 0.10

$875 \text{ SF} \times 49" \times 0.10 \div 0.70 \times 0.62 =$
3,798 Gallons Annually

Replacing cool season grass with **VERY LOW** Water Need plants saves 34,177 gallons of water annually, without changing irrigation. Change irrigation to drip with IE= 90% and save 35,021 gallons annually. Save 90% compared with cool season grass.

Sleep in summer, Grow in winter: Mediterranean climate-appropriate plants

Since many climate-appropriate plants from Mediterranean climates have **MODERATE**, **LOW** or **VERY LOW** water needs, planting them saves water when compared to cool season grass. However, most of these plants don't want water in the summertime when they are dormant; they want water in the winter, when they can grow their roots in cool soil using rainwater. Irrigation needs can be reduced by directing rainwater to the garden from the roof and other surfaces in the winter months. But beware the dry winter -- these plants will need supplemental irrigation in winter if they are to survive the following summer.





Reuse Your Graywater

B

Install a Laundry to Landscape (L2L) System

Use water from a clothes washer to irrigate the outdoor landscape. Graywater is the gently used water from bathroom sinks, showers, and clothes washers that can be directed into the landscape to provide a dependable, local source of water throughout the dry season. This is especially important for fruit-bearing and shade trees, which may suffer in times of drought.

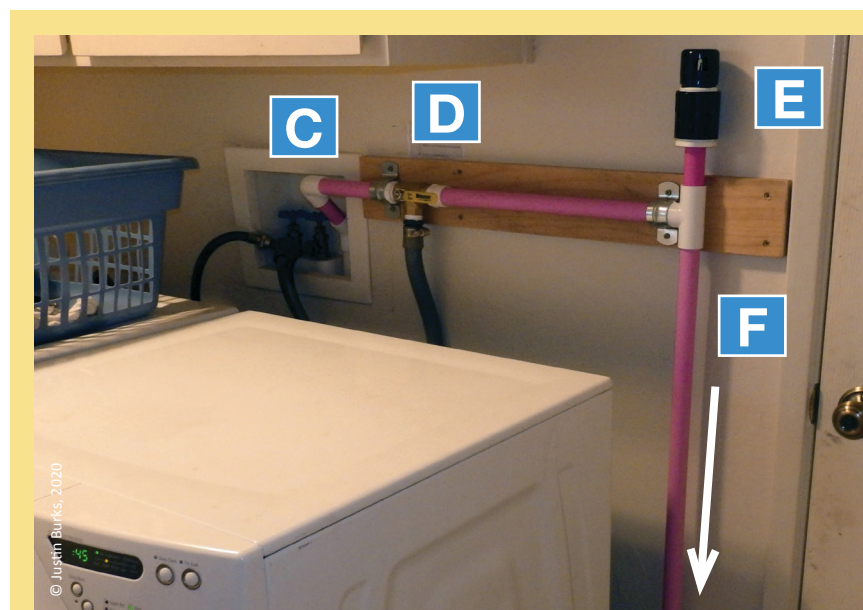
The L2L system captures the graywater from the clothes washer's drain hose and connects to a diverter valve, which allows the graywater to be directed to either the landscape or the sewer. It is one of the easiest graywater systems to construct and is very easy to maintain.

Equipment Summary

The 3/4"-1" irrigation tube must have one branch that maintains the diameter of the clothes washer drain line but may branch off into 1/2" tubing outlets to irrigate specific plants. The system does not alter the household plumbing and therefore does not require a permit in California, provided basic guidelines are followed. Determine your soil type (*see p. 15*) and use the chart below to calculate the estimated square footage of area needed to safely disburse the graywater into the landscape through mulch basins. A mulch basin is a flat-bottomed trench dug at a plant's drip line and back-filled with mulch to help graywater infiltrate deeply into soil.

Sketch out your graywater plan before you install. Free detailed instructions and how-to videos for installing your system are available at ValleyWater.org/GraywaterResources.

A. Graywater Distribution Point, B. Mulch Basin, C. Sewer Standpipe, D. 3-way Diverter Valve, E. Auto Vent, F. Line to Landscape.



Calculate Your Mulch Basin Size

Determine how much graywater you will generate per laundry load. This depends upon clothes washer type, age, and efficiency.

Graywater Gallons Per Day = Loads per 24 hours X Gallons per Load.

- Front load machine = 8-35 gallons
- Top load machine = 25-45 gallons

Your soil type ultimately determines the basin's square footage or "footprint" to prevent graywater from ponding or running off your landscape.

Basin Square Footage = Gallons Per Day x Soil Type Adjustment (Gallons per Sq. Ft. per Day)

Sandy Soil adjustment = 1.10

Clay Soil adjustment = 5.00

Consider **Laundry to Landscape**



Graywater works best for high- and medium-water use plants, fruit trees, decorative trees, shrubs, and vines. Never use graywater on edible parts of plants, like root vegetables, and avoid salt- or pH-sensitive plants. Trees, especially fruit trees, represent great opportunities for using graywater in the landscape because they may need supplemental water during drought (see p. 10).



Graywater is not sprayed. Instead, it flows through drip lines to the roots to avoid human contact and ponding. It should never connect to potable irrigation lines. Graywater and potable irrigation systems should be installed, maintained, and planned separately and independently from one another.



Seven Tips for Going Gray Gracefully

1. Match Plant Water Needs to Graywater. Select moderate and low water use plants and then use the graywater in summer to provide supplemental irrigation.

2. Calculate the Amount of Graywater available to irrigate your plants by counting the loads of laundry you do each week (see p.32). A typical medium sized fruit tree requires about 31 gallons per week during the summer, so plan accordingly.

3. Plan Your Irrigation Schedule with Your Laundry because graywater cannot be stored and must be used on the same site where it is generated within the same day.

4. Identify Distribution Points a minimum of 18" from a property line and permanently labeled in five foot increments: "CAUTION: NONPOTABLE WATER, DO NOT DRINK."

5. Plan Before You Install. Consider the best place where the line should exit the house through an exterior wall or crawl space so that it aligns with the most plants to irrigate. Identify where you may need to grade, dig, or cross a pathway. The clothes washer pump pushes water about 50 feet across a flat landscape, and a further distance downhill.

6. Install a 3-Way Diverter Valve to direct the flow to either the landscape or the sewer. Send graywater to the sewer during the rainy season or if you choose to run a laundry load with bleach or other inappropriate cleaning agents. The diverter valve should be clearly labeled and readily accessible so you never have to second guess yourself.

7. Use Non-Toxic Liquid Detergents to ensure your graywater irrigation is "plant friendly." The detergent should be non-toxic, low in salts, biocompatible, and free of boron and chlorine. Look for labels that include "SaferChoice" and "USDA Biopreferred Products."

8. Apply for a rebate before starting your project at: **WaterSavings.org**. Get detailed information on example systems, appropriate detergents, example parts lists, contractors, frequently asked questions, and virtual workshops at **WaterSavings.org**.

Irrigation System Overview

Basic Components of Most Irrigation Systems



1. Shutoff valve
(Ball valve)



2. Anti-siphon valve



3. PVC pipe



4. Sprinkler head



5. Irrigation controller

Conventional Irrigation Systems Are Notoriously Inefficient.

This is due to a variety of factors, including poor design, inadequate maintenance, and improper management. Well-designed and operated systems can reliably deliver the necessary water to sustain our landscapes without waste or excess.

A **Shutoff Valve (Ball Valve)** can be manually operated to cut off the water supply in the event of a leak, malfunction, or major repair.

The **Anti-siphon Valve**, when activated by an **Irrigation Controller**, delivers water through a **PVC Pipe** lateral irrigation line, ultimately reaching the **Sprinkler Head**, which applies water to the landscape. Add a **Backflow Preventer** in order to keep landscape water from returning to the main water line. This may be as simple as using properly-installed Anti-siphon valves.

Key Components of A Watershed Wise Irrigation System



1. Pressure regulator



2. Submeter



3. Rotary nozzle



4. Drip irrigation



5. Smart controller

Wise Irrigation Systems Operate Efficiently.

These irrigation components are designed to operate at lower pressure levels, as specified by the product manufacturer. When devices operate with excess pressure, damage, and even failure can occur, not to mention water waste.

A **Pressure Regulator** will eliminate excess pressure.

A **Submeter** is located where the irrigation system tees off of the mainline to the house and is a recommended option to keep track of the actual volume of water being applied to the landscape. Single family homes typically have a single meter that does not distinguish between indoor and outdoor water use.

Low-volume irrigation devices, like **Rotary Nozzles** and **Drip Irrigation** are designed to deliver water to the landscape at a slower rate that better approximates the infiltration rate of the soil. This reduces the likelihood of runoff.

Smart Controllers will automatically adjust irrigation schedules in response to changing site and/or weather conditions. These come in two varieties: ET controllers monitor weather conditions, while soil moisture sensors directly sample moisture in the ground. These devices also have features like “cycle-and-soak” functions that can help eliminate runoff. **Flow Sensors** catch leaks, and with a compatible controller help you shut off valves. When selecting a controller, look for brands with the **EPA WaterSense®** label. Check for rebates at Watersavings.org.



Go with the **Low Flow**: Spray or Drip?



Image courtesy of Rain Bird Corporation

Spray Irrigation Emits Water in an Overlapping (Head-To-Head) Pattern.

This can be an efficient way to irrigate large landscapes with groundcover or uniform plant material like lawns or meadows.

When properly installed, low volume spray heads apply water at about 1/3 the rate of conventional spray heads. The newer spray heads are improved so that they spray heavier water droplets that are more resistant to wind. Landscapes with grade changes using spray heads should have check valves installed to prevent water from flowing out of the heads at the lowest point in your landscape.

Gallons Per Minute (GPM) Spray systems apply water in GPM. If you know the application rate of each spray head, the distance between heads, and the pressure of your system, it is relatively easy to figure out how much water is applied every time you run your irrigation.

Challenges include irrigating very narrow areas surrounded by hardscape, or irregular patterns. Irregular patterns are particularly challenging because spray irrigation requires head-to-head coverage to be efficient and odd-shaped areas may be under- or overwatered. Replace high-volume spray heads that emit water at a much higher rate than the soil can absorb with low-flow heads, and remember to cycle and soak if you experience runoff (see p. 39).



Image courtesy of Rain Bird Corporation

Drip Irrigation Delivers Water Directly to Roots.

Since drip irrigation is covered with soil or mulch, water does not evaporate as quickly as it might if it were applied at the surface by spray.

Installations of subsurface (or under at least 3 inches of mulch) systems may be the most efficient way to irrigate nearly every type of garden area. Since the tubing is flexible, it can be made to accommodate a wide variety of irregularly shaped areas or rectangular areas when laid in a grid pattern.

Gallons Per Hour (GPH) Drip systems apply water in GPH. They need to run for longer periods of time than spray systems. However, the actual run time must always account for how fast water is applied (precipitation rate) and eliminating runoff.

Challenges include the possibility that drip systems could apply water too quickly for the soil to absorb, so careful consideration is required especially when dripline grids are installed (see p. 36). Drip irrigation operates most efficiently at low pressure (between 15 and 30 psi). Optimal performance requires the use of pressure regulation and a filtering system to keep the emitters from becoming clogged. Most low flow valves have pressure reduction and filtration included, so replace all valves that are not specified for low flow systems.



What is a Tattle-Tale?

Screw a white cap (replacing the nozzle) on to the pop-up riser of one sprinkler head on each line when converting to drip.

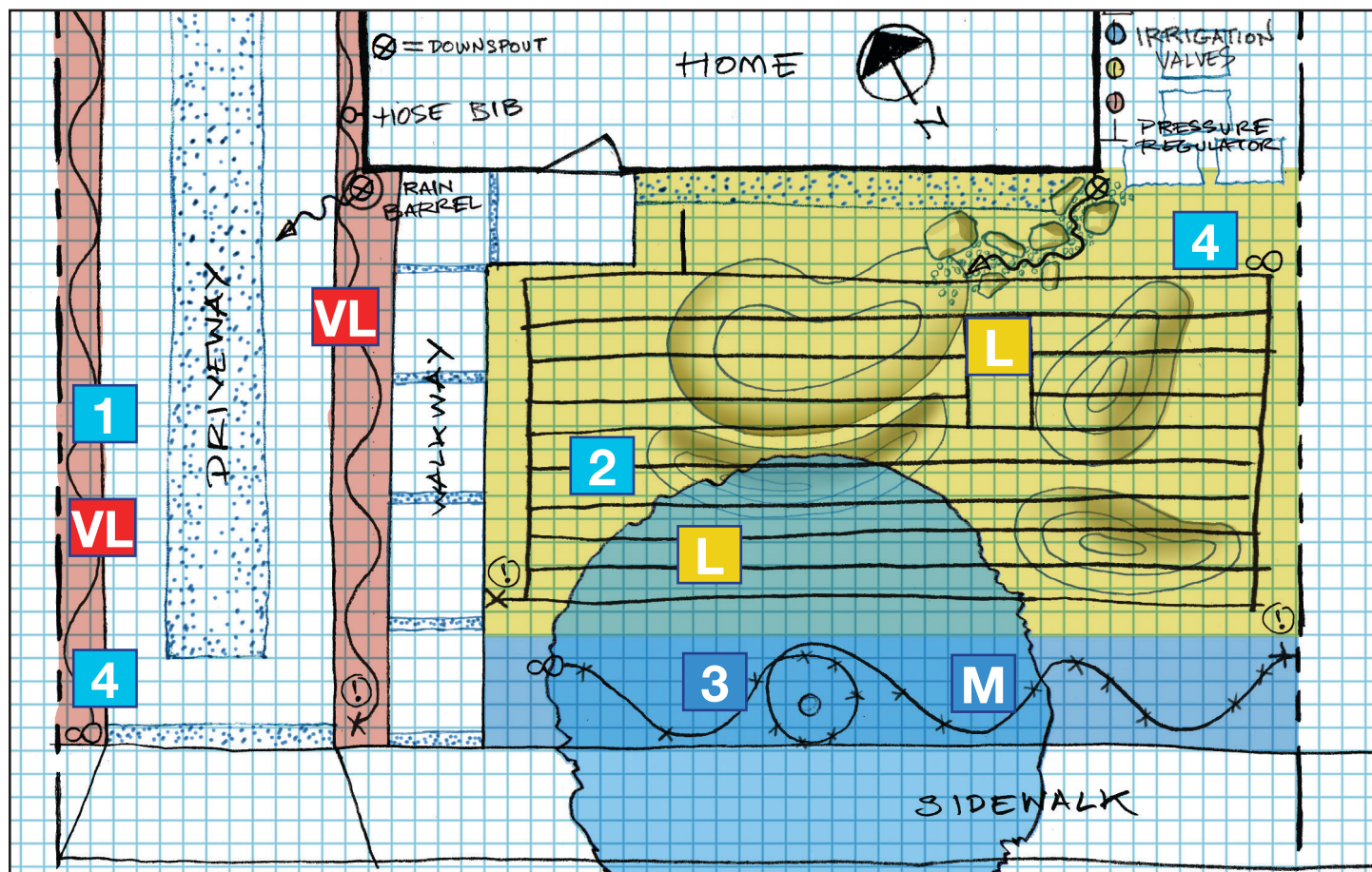
When the drip irrigation is running below the mulch, the tattle-tale will pop up and let you know that the irrigation is on. (See p. 37)

What is a Low Flow Valve?



Irrigation valves are designed to work within a certain pressure range (pounds per square inch or psi) and flow range (gallons per minute or GPM). If you redesign your system and use low flow irrigation, the flow through the valve may be so low that your existing valve will not operate effectively and may get stuck in the "open" position, wasting water. If you have flow lower than 5 GPM per valve, check your valve specifications for flow range to determine whether or not to replace your valves.

Design Using Hydrozones



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Adjust Valve Zones to Hydrozones.

Which sprinkler heads go on at the same time and what kind of plant material are they irrigating? Get ready to make changes to your irrigation system in order to accommodate both the new grading and the new plants you are introducing into your garden. In our example garden, we have three different hydrozones.

VL **VERY LOW** water use plants in the strips along the driveway will have **in-line drip irrigation in a random pattern** around each plant.

L **LOW** water use plants in front yard dry creek and berm areas will have an **in-line drip irrigation line in a grid pattern**; the grid pattern is better for situations where you want to achieve a more uniform wetting pattern that works especially well with groundcovers and high-density mixed planting.

M **MODERATE** water use plants in the parkway will have an **on-line or "point source" drip irrigation line in a random**

pattern around each plant; note that the tree gets special attention with an extra ring to accommodate its expected growth, and ideally trees should be on their own separate hydrozones.

∞ **END FIGURE "8" FLUSH VALVE**

ⓘ **TATTLE TALE**

--- **ONLINE DRIP LINE**

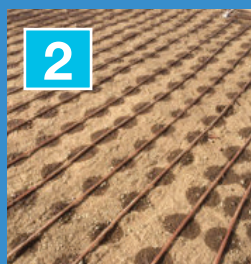
~ **INLINE DRIP LINE**

■ **MULCH OR GRAVEL**

Images courtesy of Rain Bird Corporation



On-line drip emitter inserted into blank tubing



In-line drip grid emitters are built into tubing



Tree drip ring needs to expand as tree grows



Dripline end figure 8 can double as a flush-out valve

Convert Spray to Drip

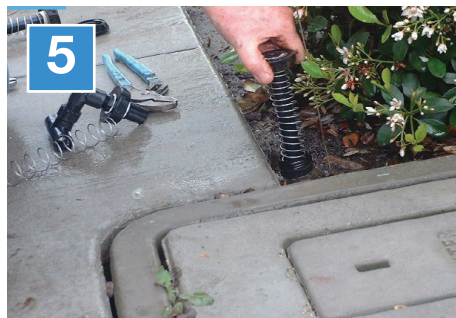
Now You Are Ready To **Irrigate** Your Landscape.

If you are renovating most of your landscape, or your irrigation system is older than 5 years and was not installed by an irrigation professional, be prepared to start from scratch rather than try to convert from spray to drip. For those newer spray systems, a conversion to drip irrigation is possible using a kit that replaces the sprinkler body.



You Will Need:

- Tools: trenching shovel, hand trowel, pliers
- Sprinkler caps
- Sprinkler Retrofit Kit
- Compression tees and elbows
- Rolls of drip tubing (1/2" blank or with in-line emitters)
- "U" soil staples
- 1 GPH pressure compensating emitters for on-line, tubing punch



Images courtesy of City of Santa Monica

If You Get Stuck An irrigation system designer or licensed landscape contractor can help you design and then install the new drip system. You will need to seek the help of a licensed plumber or landscape contractor to convert the typical irrigation valves suitable for spray to low flow valves designed for drip. Consult professional assistance if you must install a backflow prevention device to keep water that has already gone into the landscape from passing back into the household or city water system (see p.34).

Sprinklers to Drip Retrofit in Ten Steps

1. Warm Tubing In Sun to make it easier to handle. Use 1/2 inch drip tubing either with the emitters built into the tubing or blank so on-line emitters may be added later. Each emitter should not exceed 2 gallons per hour (GPH).

2. Turn On System. Mark each sprinkler with a flag. Then identify which sprinkler is the last to receive water on the line. Place 1 additional flag at that one (2 flags total).

3. Convert Last Sprinkler on the line (2 flags) to Tattle-tale (see p. 35).

4. Choose a Conveniently Located Sprinkler to install the drip retrofit kit. Place 2 additional flags at this one for a total of 3 flags. Often a drip grid is best run off a corner sprinkler (see p. 36).

5. Unscrew the Top of the sprinkler in Step 4 (3 flags). Remove the insides of the sprinkler.

6. Replace With the Retrofit Kit, elbow, and a compression tee and adapter. Note: You may need to replace the entire sprinkler head with parts provided in your kit.

7. Cap Other Sprinklers as you find them;

- For Rain Bird and Hunter sprinklers, unscrew the tops and replace with the Rain Bird caps.
- For Toro sprinklers, use Toro caps.
- For all other brands, you'll need to remove the sprinklers and install PVC caps on the riser.

8. Push Drip Tubing Into Compression Tee on both sides. Maximum of 100 feet of tubing with 1 GPH emitters per sprinkler head retrofit and 300 feet of tubing with 1 GPH emitters per valve.

9. Make a Grid with the drip tubing using elbow compression fittings to make the 90° turns. For trees, wrap a drip line around the entire tree but leave at least 12" from the trunk.

10. Replace Existing Sprinkler Valve with a low flow anti-siphon valve and install. Anti-siphon valves are not necessary if a master backflow device currently exists (see p. 34). Find rebates for drip conversions at: WaterSavings.org.

Manage Water for OWL

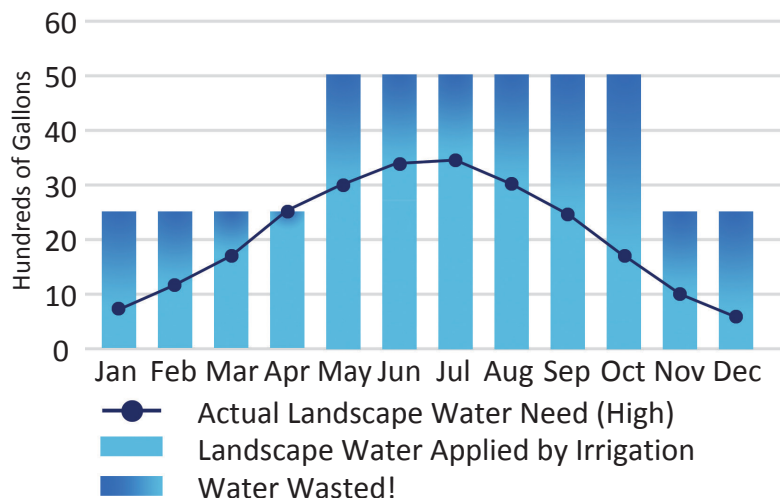
Balance Your Soil Moisture Account.

The objective of managing water wisely in the landscape is to keep just the right balance of **Oxygen** and **Water** so that plants look great, stay healthy, and **Life**, the soil microbes, are kept awake cycling nutrients. (see p.18). When **Oxygen** and **Water** are in balance within the soil, the amount of **Water** that is lost through evapotranspiration (ET) is just like writing a check for water out of the soil bank account (see p. 30).

Rain and irrigation deposit water into the soil checking account. The trick is to make sure not to apply more water than is needed in dry months, and to hold on to rainwater in the wet months. Most people apply more irrigation water than their landscape really needs. The amount of wasted water can be greatly reduced by closely managing/adjusting the landscape water applied through irrigation.

How do we tell when the account is depleted? Smart irrigation controllers and landscape professionals are able to calculate this OR you can rely on using a soil moisture probe or even probing with your fingers.

875 SF Landscape Water Not Well Managed



Wet or Dry?

Use “digital” technology! Soil may appear dry on the surface, stick your finger into the soil and make sure it’s wet below. If it’s wet up to your second knuckle, it doesn’t need any more water, so wait

another day or two. Alternatively, if you use a soil probe, you can feel the moisture in the soil and make a determination yourself (see p. 18). You can look at plant health to determine water need, but sometimes overwatering and underwatering will produce similar symptoms in plants.

Underwatering Symptoms

- Soil is bone dry
- Older leaves turn yellow or brown or drop
- Leaves are wilted
- Leaves curl and become brittle
- Stunted growth
- Plant is dead!

Overwatering Symptoms

- Soil is constantly saturated
- Leaves turn a lighter shade of green or turn yellow
- Young shoots are wilted
- Leaves are green yet brittle
- Algae and mushrooms are present
- Growth is excessive or stunted
- Plant is dead!

Plan For **Zero Runoff** (Even After Converting To Drip)

Keep Water In The Root Zone.

Just because your new regenerative landscape has a more efficient irrigation system doesn't mean that the rest of your property should not benefit from the same principles. Observe the irrigation while running and check to make sure that no water is flowing onto sidewalks, patios or walkways. If the water is being applied too fast for the soil to absorb, runoff will occur whether you irrigate using spray or drip. Puddling and pooling also may be an indication that water is applied too fast or too often. Repairs to broken pipes, drip lines, and emitters should be made immediately, or the system should be turned off until repairs can be made. The optimal time to water is in the late evening and very early morning.



Install a “Smart” Irrigation Controller that automatically adjusts irrigation schedules in response to changing site and/or weather conditions; most of these interface with mobile devices and computers, so you can change the programs in your pajamas. ET (Evapotranspiration) controllers monitor weather conditions and Soil Moisture Sensors directly sample moisture in the soil profile. When selecting a controller, look for brands with the EPA WaterSense® label.

Cycle and Soak Programming eliminates water runoff. Observe how quickly runoff occurs when you are running your irrigation. This is the MAXIMUM run time for your irrigation controller in this hydrozone. So, to cycle and soak your irrigation, you divide up the total minutes required by the hydrozone into blocks of time no longer than the observed runoff time and allow a 30 minute rest period in between the irrigation cycles. **For example, if we need 30 minutes of water in a certain hydrozone, but we observe runoff after 10 minutes, break down the 30 minute total into three 10 minute cycles with 30 minutes between each cycle.**

Hand Watering is especially good for getting a garden established when you are going to want to spend more time looking at the plants to make sure nothing is amiss. During establishment you may need to water more frequently because roots are only 4”-10” deep on a newly-planted one gallon plant. (That’s why it’s great to try to plant during the rainy season!) Be sure to use a hose shutoff so that you are not inadvertently wasting and spraying water into the street.

Really look at your plants, in the afternoon or first thing in the morning. Are they appearing droopy or sad? Is the soil very dry? If so, then give the plants a good drink and watch. Don’t water more than two days in a row, and let the soil partially dry out before watering again. Remember the symptoms of overwatering and underwatering are very similar (*see p. 38*).



Hose Shutoff Nozzle

After the first year or two, once your plants are settled, your sustainable garden should not need water more than once or twice a month, if at all. If you are at the coast, you may be able to eliminate regular irrigation altogether after establishment.

Pressure Regulation either for the whole house, or at each irrigation valve for each zone, eliminates excess pressure, and allows the irrigation system to run more efficiently. With drip systems, pressure regulation is essential, because drip lines operate best at very low pressure.

What Is Irrigation Efficiency (IE)?

Irrigation Efficiency describes how well your irrigation system is delivering water to the plants you are intending to irrigate. Since no mechanical system could be 100% efficient, the IE of any particular irrigation system will always be less than 100%. A well maintained spray system may achieve 70% IE, while a drip system could be as high as 90% IE.

Since there are many inter-connected mechanical parts of a system, there are lots of ways your irrigation can become inefficient and begin applying water in places that are not beneficial to your landscape. IE depends upon four key elements:

- 1** Design of your system reflects the best components for the specific conditions of your site.
- 2** Installation of the system uniformly distributes the water to the plants in the landscape.
- 3** Management of the system correctly balances the soil moisture account.
- 4** Maintenance adjustments and repairs are made frequently.

Tips for Eliminating Runoff: Drip or Spray

In general, several things can be done to minimize runoff due to irrigation. These include:

- 1** Convert spray systems to drip irrigation with the lower precipitation rates, pressure regulation, and a filter (*see p. 37*).
- 2** Make sure to have check valves in all hillside and low point spray systems.
- 3** Do not install spray irrigation in areas that are too narrow for spray (10’ wide or narrower).
- 4** Move spray heads 24 inches from any buildings or hard and impermeable surfaces.
- 5** Cycle and Soak irrigation run times.
- 6** Be sure to follow organic maintenance practices to keep your soil spongy.

Select Climate-appropriate Plants



Rhus integrifolia
Lemonadeberry



Ceanothus ssp.
CA Lilac species



Abutilon palmeri
Indian Mallow



Arctostaphylos ssp.
Manzanita species

California native plants have evolved over time to thrive in our unique and varied climate conditions. By learning to recognize their adaptation tricks, you can identify climate-appropriate plants wherever you are. These four characteristics will allow you to find climate-appropriate plants in a crowded nursery.

Stiff or Leathery

These leaves hold on to water and stay evergreen for most of the year.

Tiny or Little

Small leaves are like tiny solar panels that are easier to keep cool than one large hot surface.

Silver or Hairy

Light colored leaves reflect sunlight, cooling the plant. Hairy back sides of leaves hold moisture longer, cooling them off.

Solar Tracking

Leaves that appear to be standing at attention, straight up and down in the middle of the day, are solar tracking. As the day progresses, or if you see the same plant in the early morning, you will find that the leaves are more horizontally oriented. This plant is moving its solar panels to minimize the hottest sun exposure. California native manzanitas (*Arctostaphylos*) are notorious for this adaptation.

Right Plant Right Place



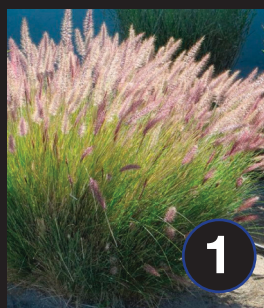
Plan for Planting. Start with a copy of your **Microclimates Maps** (see p. 17). Begin the plant design process by selecting the right plant for the right place in your garden. Use the Plant List above to practice matching plants with the conditions, and represent the plants with circles the appropriate size and color reflecting water requirements. This is the foundation of your Plant Shopping List. It's just a paper plan, so move things around! Experiment!

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Don't Plant a Pest

Remove These Invasive Plant Pests

X



1 *Pennisetum setaceum*
African Fountain Grass



2 *Vinca major*
Periwinkle



3 *Cotoneaster*
Cotoneaster



4 *Cytisus scoparius*
Scotch Broom



5 *Nassella tenuissima*
Mexican Feather Grass

Some exotic plants such as these and species of *Pyracantha*, Algerian ivy (*Hedera algeriensis*), and privet (*Ligustrum*) can be innocently planted without realizing they end up beyond the far reaches of our gardens when birds, wind or water carry them to areas where they are difficult to control.

Their spreading and greedy behavior can take over native habitats, inhibiting areas for all to enjoy. Few of these species offer any benefits to the local animals and insects. Invasive species and species that act like invasives should be removed from your gardens, removed from nursery stock and should not be planted in the first place.

Plant These Well Behaved Alternatives Instead

✓



1 *Melica imperfecta*
Small Flowered Melica



2 *Campanula poscharskyana*
Serbian Bellflower



3 *Heteromeles arbutifolia*
Toyon / Christmas Berry



4 *Peritoma arborea*
Bladderpod



5 *Stipa cernua*
Nodding Needlegrass



PlantRight www.PlantRight.org

Since 2005, PlantRight has been working with California's nursery industry to stop the sale of horticultural invasive plants in ways that are good for business and the environment. PlantRight unites leaders from California's nursery and landscape industries, conservation groups, academia, and government agencies in a voluntary, science-based, and collaborative way. PlantRight's Plant List, identifying the highest priority invasive garden plants, is the cornerstone of the program. For each plant on the invasive plant list, PlantRight suggests several non-invasive alternatives. Retailer partners pledge not to sell any plants on the Plant List, and any plants added to the list in the future. To track its progress and inform the plant list, PlantRight conducts a survey of retail nurseries throughout the state. PlantRight also has a Continuing Education program available for free to anyone who wants to learn about horticultural invasive plants.



California Native Plant Society (CNPS) CNPS.org, Calscape.org

Our gardens play an important role in local ecosystems. The plants we choose for our gardens have the power to support pollinators, build wildlife corridors, and restore our natural landscapes. **Calscape.org**, is a tool CNPS has developed that makes it easier for gardeners to create thriving, natural gardens and avoid invasive plants. Use it to discover which plants are native to your location and to search by water requirements, blooming season, pollinator habitat and more. You also can build custom plant lists and find nearby nurseries who carry the plants you want. In addition to online resources, CNPS has 35 local chapters statewide that host native plant sales, garden tours, field trips, and expert talks.

Do Plant with **Confidence**

Get Ready to **Install** Plants!

Follow these simple steps to achieve healthier roots and stronger overall plant growth. It will take a contractor longer to plant this way, so expect a higher installation cost. However, the outcome is less plant shock and better, faster establishment of vigorous plants.

You Will Need:

- Tools: shovel, hand trowel, buckets, hose with shut-off nozzle
- Plants
- Compost
- Mulch

Add These For More Advanced Planting:

- Mycorrhizae (not for grasses)
- Fish Emulsion or Water Soluble Humates

All photos this page: © Paul Herzog, 2020



What's with all the **Water**?

Drainage. If the water does not drain within an hour or so, it's probably not a good place to plant a climate-appropriate plant until you fix the soil compaction (*see p. 19*). Squared holes in heavy clay soil drain faster, and the corners facilitate root establishment.

Kickstart OWL (Oxygen, Water and Life). By watering so thoroughly, you are getting soil organisms that might be in the surrounding soil ready to "wake up" and start cycling nutrients for the plant.

Plant Shock. The major reason plants suffer from planting shock is that the dry soil around the new plants wicks water away from their rootball, sending plants into shock from which they never recover. By watering the surrounding soil, you reduce the probability of plant shock. Also, planting on overcast days, late in the afternoon on hot days, and in the rainy season help with overcoming plant shock. Make sure the rootball of your plant is kept moist. Keep an eye on your drip irrigation and timer to be sure irrigation is running for establishment.

Successful Planting In Ten Easy Steps

1. Dig A Hole! Don't dig it any deeper than the rootball of the plant. Do dig at least a little bit wider than the plant to loosen the surrounding soil. If you accidentally dig too deep, be sure to put the soil back in and tamp it down firmly before moving on, to give your plant a solid base.

2. Throw In Some Compost or worm castings no more than 1" deep - along the bottom of the hole. Never put mulch in a hole! **And don't bother with fertilizers either.**

3. Fill The Hole With Water TWICE, and allow it to drain completely each time. This will take a long time, unless your soil is really sandy. Start digging the next hole, or take a break.

4. Submerge The Rootball in a bucket of water until air bubbles stop bubbling up. Keep the plant in its container, or you can take it out - just be careful with the delicate roots.

5. Add Fish Emulsion or soluble humate to the water (follow label directions). Dust the rootball with a mycorrhizae inoculant (only if the plants are woody, so don't bother with the grasses).

6. Place Plant In Hole, make sure the root collar (that's where the roots join the stem or trunk) is a bit (1/2" - 1") higher than the surrounding soil/ existing grade. This is super important because we don't want the plant to get choked by the surrounding soil.

7. Backfill The Hole With Water one more time (this time with the plant in it) and let it drain completely.

8. Now Fill The Hole With The Soil you dug out (not with fancy potting soil!), making sure the soil slopes away from the root collar. Tamp the soil down (use your feet, but be gentle) so the plant doesn't move around.

9. Don't Create A Bowl around the plant. Really! Your plant doesn't need it and it might make a moat that would drown your climate-appropriate plant.

10. Water The Soil All Around The Plant one more time, and deeply. And have a drink of water yourself!

Steward Your Land

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Congratulations! Your beautiful new garden is now installed. Your garden is alive (more alive now than ever) and it will need some tending to thrive. A newly planted garden requires some extra time and special attention to bring it to its full potential.

Add Organics. As mulch breaks down, add more! The easiest way to do this is to use falling leaves from your trees. A leaf-covered garden is a healthy garden! You can brush them off patios, walkways and stairs right onto the existing mulch. No falling leaves? You can get more mulch from your local composting facility, or order it from a local nursery or building supply yard. Remember to “chop it and drop it” when pruning.

Weed. You are going to have to weed, especially after the winter rains, and especially in the first year or two. Even with a thick layer of mulch, you may still have some weeds popping up. Be sure to eliminate them regularly, and then feed your soil some compost to improve the root systems of the plants. Consider cutting weeds down to the soil level rather than pulling out roots and disturbing the soil.

Water. Especially during the winters of the first two years after planting, you need to give your plants a little extra water. Not too much! Remember, these plants (and your soil) will be healthier, live longer, and grow stronger if you give them just enough water.

Prune. Get a good pair of hand clippers, gently prune trees, perennials, and grasses as needed. Mow your natural lawn annually after it has self-seeded to keep it clean and walkable. Don't mow it too short - look up the grasses and/or sedges that you used and follow growers' directions.

Maintain For Rain. Check downspout connections and overflows annually to make sure they're working properly. If you don't have gutters and downspouts, make sure there are no areas of erosion around your house. Consider adding a rain chain and small bit of gutter if you need to direct water away from a highly eroded area. Loosen your soil if it's become compacted. Remove and relocate extra soil or silt that's built up, and add mulch if needed.

Harvest. Fruits, vegetables, seeds and flowers - it's up to you to pick them when they're ready, before the birds and other creatures get them. If you have stiff competition in your neighborhood, invest in some bird netting or lightweight mesh bags and wrap your trees, vines, shrubs or the fruit itself a week or two before it's ready to harvest. Be sure to clean up and compost fallen fruit to limit pests.

Integrated Pest Management (IPM). A few aphids or caterpillars will feed the birds, but a massive infestation requires immediate action on your part. Remove diseased plant material and don't put it in your compost pile. Wash off unwanted insects with your hose. If they come back try spraying them with a mixture of mild dish soap and water, or with compost tea. Spread worm castings and mulch.

Go Out and Have Fun! By spending time relaxing and playing in your garden you will be more aware of how it's growing, how it changes, and what it needs.



Maintain Lawn Organically

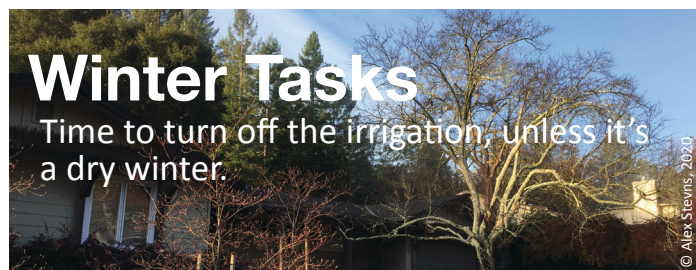
If you decide to keep your grass, follow these guidelines to maintain it organically so that it will play nicely with the rest of your watershed wise landscape.

- Aerate and de-thatch annually
- Topdress annually with 1/8" - 1/4" good well-decomposed compost or worm castings
- Manage your irrigation
- Mow less frequently
- Maintain 3" - 4" height on cool season grass and 1-1/2" to 2" height on warm season grass
- Grass-cycle every time you mow or use a mulching mower
- Do not allow seed heads to form on the grass (remove if they do)
- Consider over-seeding with clover to turn it into a "Natural Lawn" (see p.12).
- Eliminate chemical inputs

Garden Maintenance Checklist



- ☐ General Landscape Management
 - Review plant health and investigate reasons for observed decline
 - Weed and deadhead flowers as needed
 - Stake trees: add new or make adjustments
- ☐ Maintain Rainwater Capture Systems
 - Make sure gutters and downspouts are not clogged
 - Clean rainbarrels/cisterns and clean out catch basins
 - Drill holes in bottoms of catch basins, if standing water
 - Make sure mosquito screens are not ripped or loose
 - Flush pipes
 - Remove debris from swales, especially at inlets/outlets
 - Refurbish berms and basins as needed
- ☐ Add Compost or Worm Castings
 - De-compact or aerate lawns and areas around trees/ large shrubs and add worm castings/compost
- ☐ Replenish Mulch
 - Maintain 2" if established garden, 4" - 6" if still getting established
- ☐ Late Fall Pruning (Chop and Drop)
 - Cut back grasses (once a year for deciduous, less often for evergreen)
 - Cut back native salvias (sages) by 1/3
 - Cut back spring-blooming herbaceous perennials and pinch back non-woody shrubs
- ☐ Irrigation Checkup
 - Turn on each valve to check for problems and make repairs
 - Open manual flush valves and flush
 - Clean irrigation filters
 - Adjust controller - reduce time



- ☐ General Landscape Management
 - Review plant health and investigate reasons for observed decline
 - Weed and deadhead flowers as needed
 - Stake trees: add new or make adjustments

- ☐ Pruning (Chop and Drop)
 - Prune dead, diseased, damaged, and deranged branches of trees and large shrubs
 - Cut back summer and fall-blooming herbaceous perennials and pinch back non-woody shrubs
- ☐ Still Time to Plant (but not in saturated soil!)
- ☐ Irrigation Checkup
 - Turn on each valve to check for problems and make repairs
 - Manually run irrigation if the weather has been very dry



- ☐ General Landscape Management
 - Review plant health and investigate reasons for observed decline
 - Weed and deadhead flowers as needed
- ☐ Replenish Mulch
 - Maintain 2" if established garden, 4" - 6" if still getting established
- ☐ Irrigation Checkup
 - Turn on each valve to check for problems and make repairs
 - Open flush valves and flush
 - Clean irrigation filters
 - Seasonally adjust automatic irrigation schedule
 - Move drip irrigation and add emitters as the tree grows in order to maintain the wetting zone at the outside edge of the tree's canopy (dripline)



- ☐ General Landscape Management
 - Review plant health and investigate reasons for observed decline
 - Weed and deadhead flowers as needed
- ☐ Irrigation Checkup
 - Turn on each valve to check for problems and make repairs
 - Return irrigation controller to summer program

Landscape with a Professional



Assessment Organizations including site assessment and testing, various measuring services, surveyors, soil testing services and even Google Maps are available to help. Property measuring and surveying companies can develop more detailed plans with elevations, sighting of trees and landscape amenities, irrigation, etc. If you get out into the yard with a measuring tape and the guidelines we've put into this book, you should be able to make a serviceable site plan to scale.

Planning and Design professionals can help you develop a working plan and budget for your landscape. The plan should include drawings, a list of resources, and an outline of the techniques to be used to implement the plan. Licensed landscape architects and licensed landscape contractors can assist you in developing a plan and budget. Landscape designers also can help you create a conceptual design. Working with a licensed professional (architect, landscape architect, landscape contractor or civil engineer) is recommended if you have hillsides and slopes or complicated structures. APLDCA.org; ASLA.org; ASCE.org

Landscape Installation and Construction

professionals are licensed landscape contractors who specialize in building landscapes, and are able to work on all aspects of the sustainable landscape plan. If you are handy, and feel comfortable with the techniques outlined in this book, there is no reason why you cannot install your own garden, especially knowing that if you get stuck you can call upon the expertise of a landscape professional. Find licensed contractors at the California Landscape Contractors Association (CLCA). CLCA.org

Certified Arborists are specialists trained in the art and science of planting, caring for, and maintaining individual trees. Arborists are knowledgeable about the needs of trees and are trained and equipped to provide proper care. Find tree consultants at the American Society of Consulting Arborists (ASCA). ASCA-Consultants.org

Rainwater Catchment specialists include people certified by the American Rainwater Catchment Systems Association (ARCSA) to design and install rainwater capture systems. These professionals can bring a lot of specific expertise to your project, particularly if it involves the installation of an active capture system such as a cistern. ARCSA.org

Greywater Action can assist you on an as-needed basis if you are attempting a DIY renovation. Their expertise is in the design and installation of laundry-to-landscape greywater systems. GreyWaterAction.org

Irrigation Systems Consultants include people who have been certified by an EPA WaterSense® labeled certifying organization to provide irrigation system auditing, design, and maintenance. These professionals can bring specific expertise on improving the efficiency of irrigation systems. Irrigation.org; QWEL.net

Water Managers are a big part of ongoing landscape maintenance. Learning how to manage your own water is best, but if you are still using an irrigation system for your landscape, you may consider hiring a certified professional who has demonstrated expertise in water management. WaterSavings.org

Watershed Wise Landscape Professionals

are people who are certified to provide site evaluation and consulting on using the watershed approach to landscaping in design, construction, and maintenance.

GreenGardensGroup.com

Plant Selection specialists include your local retail nursery and garden center, native plant societies, Master Gardeners, and professional gardeners. The best plant selector, however, is you! Do the homework to select plants that are both climate-appropriate and locally native to your place, and you will be rewarded with a better understanding and appreciation of your garden as it evolves over time. Plus, you can advise your friends on their plant selections! WaterSavings.org

Maintenance of sustainable landscapes requires an understanding of the watershed approach to landscaping and water management. While there will be less mowing of lawns and blowing of leaves, there will be more fine pruning, irrigation flushing and tuning, cleaning and checking rain barrels and other water retention devices and soil building. Maintenance people should demonstrate an ability to think critically, be open to the techniques and ideas outlined in these guidelines and understand how to implement IPM, mulching, basic irrigation tune-ups, and native plant husbandry. WaterSavings.org





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Clean Water • Healthy Environment • Flood Protection

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Email: Conservation@ValleyWater.org



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