



Public Works
LOS ANGELES COUNTY

Los Angeles County Public Works
Environmental Programs Division

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Smart Gardening Fact Sheet

WATER-WISE GARDENING

I always thought a yard was three feet . . . then I started mowing the lawn.
C.E. Cowman

INTRODUCTION

With all the trees, shrubs and grass we have growing in Southern California, it's easy to forget we live in a desert. On average, most families use about 500 gallons of water per day, and over 30% is used to water their yards and gardens. By implementing some, or all, of the water-wise gardening ideas presented here, you can save 50% or more of the water you use while keeping your yards and gardens green and healthy.

As you can see from the map of California Water Projects, Los Angeles County relies heavily on water from other parts of the state. In an average year, we import millions of gallons of water from northern and central California, the Owens Valley and the Colorado River, and pump millions more from groundwater wells that draw water out of our regional aquifers. Increasingly, water is in short supply and is becoming more expensive. Additionally, California faces repeating cycles of heavy rains (El Niño) followed by drought (La Niña). In fact, historically, our state has faced prolonged droughts that have lasted over 50 years.

It is critical, then, that everyone work to conserve as much water as possible. Water-wise gardening involves using various landscaping techniques that help conserve water while maintaining a beautiful and efficient yard. The 10 principles of water-wise gardening are:

1. Follow the Land - by watching where rain runs after it falls onto your yard. The contours of your yard can be changed to catch the rainwater, and speed or slow its flow, holding it in the ground for use by plants.
2. Water Wisely - give plants only as much water as they need. Use efficient watering methods such as drip systems and soaker hose that deliver the water closer to the plants roots. Many plants adapted to dry summers do not need much water a few years after planting.
3. Care for the Soil - by adding compost or mulch. Compost helps the soil hold water and adds nutrients needed for plant growth. Mulches prevent the soil from overheating and drying out. Mulch also helps reduce weeds and slow erosion. Use 2" - 4" underneath plants and shrubs.
4. Tend Patiently - with a sparing hand and keeping in mind that plants will grow larger. Plants use nutrients found



Figure 1
Map of California Water Projects

naturally in the soil and in the added compost. They do not usually need man-made chemicals to make them grow better.

5. Gather the Rain - by catching it in rain barrels when it falls and holding it for later use. The rainwater costs nothing and it can be used in your garden during the summer when the ground is dry.
6. Prune Naturally - try not to force plants to grow into unnatural shapes, it's hard on the plant and it generates more green waste that you will need to compost or shred for mulch. Learn to work with your plants and prune to achieve a more natural form.
7. Plant Naturally - by layering plants to make shade and using species that are native to Southern California or other dry, Mediterranean-type climates. These plants are naturally rain-watered and are adapted to the wet winter and dry summer conditions typical of Southern California.
8. Plan Your Garden - a garden can be a natural oasis in an otherwise barren urban desert. Use your garden to expand your living area into the great outdoors. Understand the natural shade and sun of your yard and plan your garden accordingly. Remember: plan the work, then work the plan.
9. Plant Wisely - only use plants that have been grown in a nursery or that come from collected seeds or cuttings. Never dig up and take wild plants, it's illegal and damages the ecosystem. Leave them in their natural habitat for everyone to enjoy. You should also group your plants together, placing water loving plants together and drought-tolerant plants elsewhere (hydrozoning). This allows you to give your plants just the right amount of water, avoiding over-watering and waste.
10. Share Your Wisdom - talk to neighbors and other people in your local community. Help people to develop a knowledge and wisdom of the land so that Los Angeles County will continue to be a healthy place to live and work.

GARDENING CLIMATE ZONES

Two methods have been developed for evaluating climate impacts and are commonly used throughout the western US. The first was developed by the US Department of Agriculture in cooperation with the National Weather Service (NWS) has identified various regions within North America by their 60-year average minimum winter temperature. These regions,

called "hardiness zones," are represented by bands across the continent.

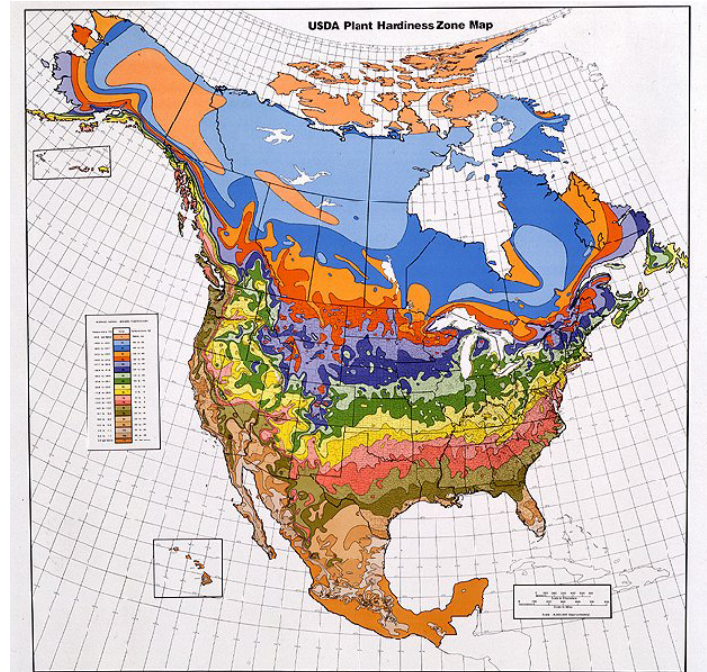


Figure 2
USDA Plant Hardiness Zones Map

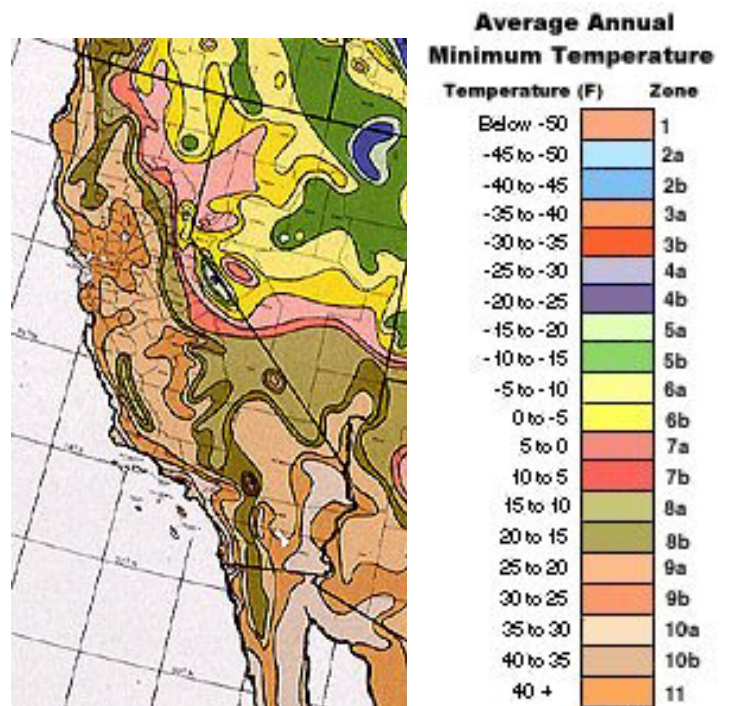


Figure 3
California USDA Plant Hardiness Zones Map

In Southern California, we are generally in one of three zones: 10a, 10b or 11 (some mountainous areas are in zones 9a or 9b). This means that in most areas, the average minimum temperature never gets below freezing, except on rare occasions.

The second is a 24-zone climate system developed based on research conducted by the University of California Berkeley and popularized by Sunset Magazine over the last 40 years.



Figure 4
Sunset Climate Zone Map

The Sunset zone maps, which cover the entire United States, are generally considered to be more precise than the USDA's, since they factor in not only winter minimum temperatures, but also summer highs, lengths of growing seasons, humidity, and rainfall patterns to provide a more accurate picture of growing conditions in a particular area. In Southern California, many nurseries and garden centers refer to the Sunset climate zones rather than the USDA plant hardiness zones.

So, what are plant hardiness zones and climate zones? Simply, these zones were developed to help farmers and gardeners know which plants will grow where, so they wouldn't plant things that would just die because they weren't well suited to the region's temperatures. So what's wrong with these zones? While they're useful for understanding temperature variation, this is not the only factor you need to know to determine whether a plant will survive in your garden. Soil types, rainfall, daytime temperatures, day length, wind, humidity and heat also play their roles. You need to know what will work in your own yard or garden.

Microclimates

In every yard or garden, there are areas where plants will grow and others where they will die. This is because of small differences in the temperature, wind, sun, water, protective surroundings and even other plants. Most gardens have two or more microclimates and it's critical that plants be selected to suit the local microclimate. Houses, walls, fences and other plants can all affect the amount of sun or shade in a garden. Sunny areas tend to heat up and dry out faster than shaded areas. Shaded areas, on the other hand, receive less sunlight and tend to be cooler and stay wetter than sunny areas.

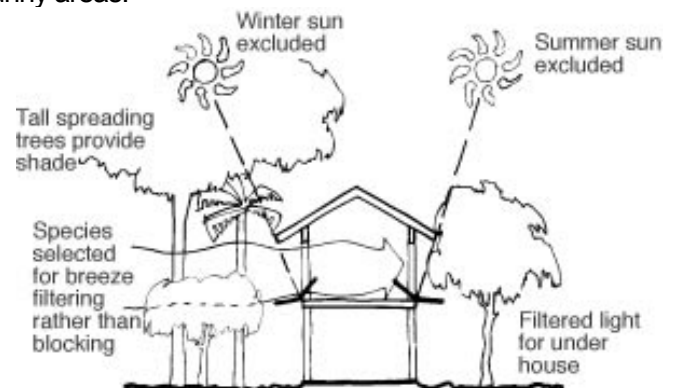


Figure 5
Using Trees and Shrubs to
Create a Microclimate for Your Home

The amount and extent of both sunlight and shade is seasonal. Shadows are longer in winter (with the noon sun at about 30 degrees up) and shorter in summer (with the noon sun at about 75 degrees up). In addition, winter days are also shorter, as short as about 10 hours in many areas of Los Angeles County.

During the summer, on the other hand, days are longer, lasting up to 14 hours. Even under full direct sunlight, some variation in sunlight intensity and heat gain will occur due to

angle-of-attack, heat absorption and reflection effects. South and southwest facing structures receive more intense sunlight than north or northeast facing structures. East-west running walls, fences and buildings reflect more sunlight towards their south sides while creating shadier regions on their north sides.

In addition, these structures may act as heat sinks, actively storing and releasing heat for many hours after sunset. Similarly, but to a lesser extent, north-south running walls and fences create warmer regions on their west sides and cooler regions to their east. The material the wall is made of (and painted with) can also moderate or enhance the amount of sunlight and heat that is reflected back into the garden.

Night Exposure

At night, yards and gardens typically lose heat. Much of this loss is radiated upward into the atmosphere, or more accurately, out into space (ultimately). Clouds and humidity tend to insulate the ground from this type of heat loss, absorbing and reflecting the heat back toward the ground. This is the reason why desert nights are often extremely cold, whereas coastal regions may cool only slightly. In a yard or garden, any overhead structures, such as shade arbors and trellises will insulate the area directly underneath. That's why it's warmer at night under a tree than out in the open. It's this type of heat loss and heat gain that usually determines which areas in the garden are most susceptible to dehydration in the summer or frost in the fall, winter and spring.

Cold-Air Basins

Cold air can be collected and trapped by depressions or basins in a yard or garden, including man-made barriers like houses, walls, or fences. Sloped gardens tend to be warmer, and less susceptible to frost, than their immediate surroundings since cold air is easily drained off and replaced by warmer air from above.

Heat Sinks

As everyone in Southern California knows, the ocean is a powerful climate modifier. Along the coast, the summer temperatures average 5 - 25 degrees cooler than inland. Depending on the weather conditions, there are even days when it can be cloudy and foggy at the coast, while inland the temperatures soar to over 100 degrees. Even relatively small water bodies like backyard pools and ponds can create a garden microclimate that is cooler during the day and warmer at night. To a lesser extent, areas like driveways, walls and

buildings which retain heat may also have similar moderating influences.

Wind

In general, Southern California experiences westerly air currents during the day and easterly air currents at night. The wind tends to be greater near the coast and at the base of canyons. However, the local terrain topology can produce all sorts of unusual, and sometimes severe, wind patterns. In some cases, structures and plantings such as trees and shrubs can be used to control undesirable winds, or even to direct cooling winds into certain areas.



Figure 6
Satellite Photograph
Dust from Santa Ana Winds

HYDROZONES

Hydrozones are an ancient technique that really means nothing more than grouping plants together according to their water (as well as soil, nutrient, pH, etc.) needs. By carefully picking your plants, grouping them together according to their water and other needs and using modern low-flow irrigation techniques, you can drastically reduce the amount of water you use, lower your water bill, save time, and generate less yard waste.

Reducing water waste also helps you get stronger, healthier plants by directly applying water to the root zones of plants, where it's needed and used more efficiently. A key to this technique is establishing a watering schedule. This allows you to precisely control the quantity, timing and placement of water, so you will use it more effectively.

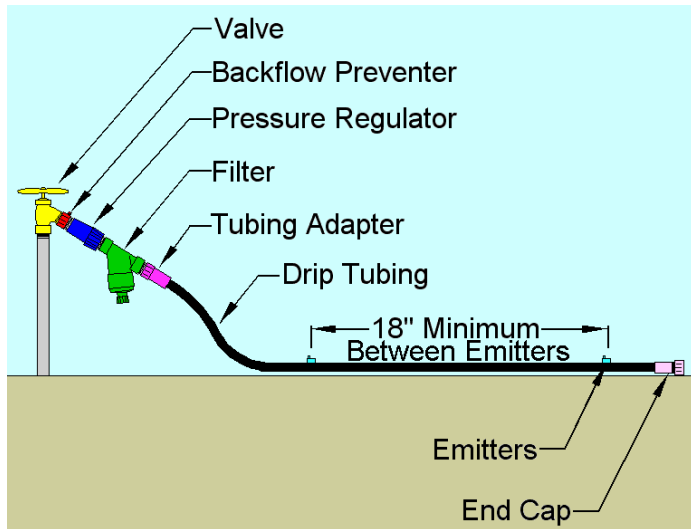


Figure 7
Drip Irrigation Set-up

Low flow watering systems apply water at or near grade, virtually eliminating runoff and over-spray, and minimizing evaporation. Because you can also adjust these systems to allow deep watering, you can also encourage plants to develop deep root systems, improving drought resistance. Low-volume systems can be as much as 95% efficient, compared with 60-70% for conventional systems.

To use the hydrozone approach, just follow these six simple steps:

STEP 1: ANALYZE YOUR SITE

The first step to successfully using the hydrozone concept is to look over your yard or garden carefully. Pay particular attention to the natural slope of the area, the soil type(s) present, your general climate zone as well as any microclimate issues in the area, and your existing and planned plant species.

In general, you should try to group plants that have the highest water demand (use) together at the highest point in your yard. When you water your yard and garden, the water drains into the soil and subsoil and begins to move down-gradient (downhill). If you put the highest water demand plants at the high point of your yard, then any water that drains into the soil and subsoil will move down through your yard, helping water other plants and encouraging deep rooting.



Figure 8
Placing High Water-Use Plants at the Top of a Slope

Soil Type

Knowing what kind of soil you have is critical to successful hydrozoning. If your soil is sandy, water will percolate downward very quickly but will not move out laterally. If your soil is a heavier, denser clay, the particles are frequently so compact that water spreads quite far horizontally before it's able to penetrate down into the soil column. This type of soil frequently experiences substantial runoff problems when watered. In Southern California, we have both types of soil, and most sites are actually a combination of both types. One nearly universal problem, though, is that most soils in Southern California lack organic material (for more details, please refer to the section on Soils).

Climate and Microclimate

First, check the climate zone map to see what kind of area you live in. Think about how hot your area gets in the summer, and how cool in the winter. Also, if you're near the coastal areas, you'll need to consider that humidity may limit your plant choices. Microclimates are smaller areas of your yard or garden where the normal temperature, amount of sun or shade, and reflected light and heat create special needs. For example, plants in sheltered areas with more direct sun

surrounded buildings or other structures that may absorb heat will need more water than plants in shady areas surrounded by lawn or other plants.

STEP 2: PLAN YOUR SITE

It is critical to make an accurate, complete plan of your yard or garden. The effort you make during this step will save you considerable time and effort later. If you are planning a new yard or garden, you can control more easily how plants are grouped and arranging so that plants with similar water requirements are grouped together. This will mean that the hydrozone groupings will naturally follow the physical layout of the yard or garden.



Figure 9
Landscape Plan for Residential Area

Revising or remodeling an existing yard or garden can be more challenging to design than new sites. In many cases, you may find that plants with very different water requirements are located next to each other. If this is true in your case, you will need to be careful not to mix plants with widely varying water requirements in the same hydrozone.

For example, if you have an area that contains plants with differing water needs, you may want to group them into separate hydrozones according to low, medium, and high water requirements. You may also need to install separate irrigation line controllers so that plants with varying water demands can be watered individually according to their needs. If you really want precision in your watering, many manufacturers supply a variety of devices that actually measure soil moisture content and automatically water only when the plants really need it. These systems are slightly more expensive, but keep water use to a minimum.

STEP 3: IRRIGATE THE BASE PLANT

In each planting area or hydrozone, you will generally select a main, or "base plant." The base plant is the plant in the hydrozone that requires the smallest amount of water each day. When you plan your irrigation schedule, you will design each hydrozone's general watering system to irrigate the base plant, and then select individual emission devices to meet the water requirements of the remaining plants in the hydrozone that require more water than the base plants. For "worst case" irrigation you should establish water needs based on the hottest, driest day in the summer.

Adjusting for Climate and Microclimate

When developing your irrigation schedule, you should consider that most manufacturers establish their recommendation based on national averages. To adjust these recommendations for your specific climate and microclimates, you need to consider if the normal summer high temperatures in your yard or garden is substantially above 90°F (32°C), and/or the normal relative humidity is below 50%. If it is, then you should increase the daily run time of the base plant watering schedule by approximately 50%. However, you should always use caution when adjusting the irrigation schedule and observe your plants to be sure they are getting the proper amount of water. Check for water and heat stress regularly.

STEP 4: IRRIGATE NON-BASE PLANTS

Each hydrozone will have only one base plant. Because the base plant requires the smallest amount of water each day, the irrigation system should be designed to service the base plant. The remaining plants in each hydrozone are "non-base" plants. For each non-base plant in each hydrozone you should carefully determine each plant's water requirements. As in Step 3, the normal water demand of each plant should be adjusted as shown below:

- If the normal summer high temperatures in your yard or garden is substantially above 90°F (32°C), and/or the normal relative humidity is below 50%, increase the water requirement for each non-base plant by 50 percent.
- If your yard or garden is located in a cool climate, decrease the water requirement for each non-base plant by 50 percent.
- If your yard or garden is in full sun throughout the day or it is surrounded by reflective structures or paving,

increase the water requirement for each non-base plant by 25 percent. (Caution: you should calculate this adjustment before any adjustments are made for climate).

- If your yard or garden is in full shade throughout the day, decrease the water requirement for each non-base plant by 25 percent. (Caution: you should also calculate this adjustment before any adjustments are made for climate.)

STEP 5: LAYOUT THE IRRIGATION SYSTEM

Most yard and garden irrigation systems consist of two related subsystems: sprinklers and low-flow emitters. Designing and laying out a low-flow hydrozone irrigation system is very similar to a conventional sprinkler system. Most low-flow systems rely on 1/2-inch rigid or flexible tubing connected to sprinkler heads that water the base plants and low-flow emitter heads and distribution tubing that bring additional water directly to plants in each hydrozone that require more water than the base plants.

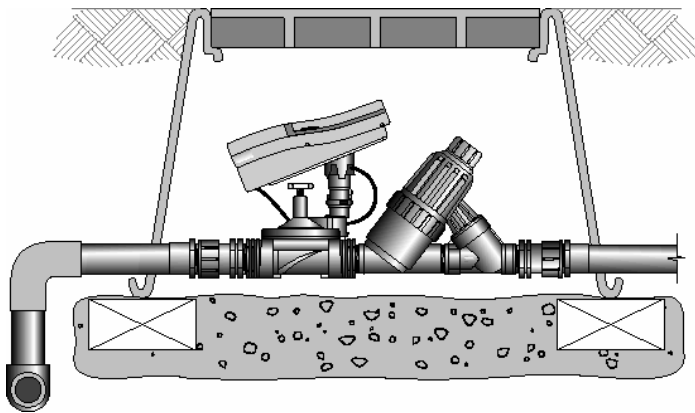


Figure 10
In-Ground Installation of a Battery Operated Control Valve and Backflow Check Valve

The key to these systems is the use of control valves and timers that allow you to adjust the watering schedule with great precision. When laying out the location of sprinkler heads, care should be taken to ensure even, complete coverage with individual spray heads selected to cover only the areas needing water. This will prevent waste and overspray from the sprinklers. Individual drip or low-flow emitters should be evenly spaced around each plant. Generally, it is good practice to place each emitters placed half way between the trunk of the plant and its drip line (the edge of the foliage of the plant.)

STEP 6: ADJUST AND MAINTAIN THE IRRIGATION SYSTEM

During the first one or two months, carefully watch both the base and non-base plants for signs of heat or water stress. It is generally advisable to over-water initially, and then gradually reduce the watering schedule. Adjust the amount of water being given to each plant as necessary to avoid over- or under-watering. Check the wetting patterns around every plant to be sure that they're receiving water. Check every emitter head to make sure they're working and inspect all filters weekly. Low-flow emitters have very small openings that can become clogged with pipe scale or other debris. If an emitter is clogged, use the manufacturer's recommended tool or method to clear the emitter. After the first month, you should inspect and clean all filters and emitters on a monthly basis. Also check the individual timers and valves to make sure they're working. If plants show signs of heat or water stress, adjust the system as necessary. A good preventative maintenance practice is to flush the entire irrigation system each spring and fall to flush debris that may accumulate in the piping and valves.

DROUGHT TOLERANT PLANTS

Drought-tolerant plants, shrubs and trees are specially adapted to grow well in regions that get little, or infrequent, amounts of normal rain. These plants require less water to live in Southern California's natural climate and soil and tend to be more pest and disease resistant. Some of these plants are native species, while others are imported, typically from other areas of the world with a similar Mediterranean climate, such as Southern Europe, North Africa, South Africa, Australia, Brazil and some coastal areas of Mexico.

Pick the Right Plants

Choosing the appropriate drought-tolerant plants for your landscape is important. There are many sources of information about drought tolerant plants, including the *Western Garden Guide*© by Sunset Books, Inc. and *Xeriscape Gardening*© written by Ellefson, Stephens and Welsh. Another excellent resource is to ask someone at a local gardening center or native plant specialty nursery to show you plants that are native to Southern California or that are well adapted to our climate. Always group plants according to soil, water and sunlight needs, making sure that they are compatible with your overall landscape design as well. The more time you spend thinking about your landscape before you start, the less time you'll need to spend changing things after you plant. A well-designed area not

only is more enjoyable to look at, but it's better for your plants and can reduce your overall cost of maintenance.

Pick the Right Time

There is a myth among people who like to use native plants that fall is the only time to plant. This couldn't be farther from the truth. In general, the best time to plant in Southern California is in the winter or spring, and if care is taken, you can plant successfully in the summer and fall, as well.

The key to success with native plants is to treat them just like a normal plant (e.g. provide them with infrequent, deep watering when ever they show signs of stress) the first year. Once established, virtually all native plants are highly drought tolerant and can survive on just the water they receive from normal rainfall. It is important to remember, though, that even drought-tolerant plants, shrubs and trees may occasionally need some additional water, so it is important to learn to recognize signs of heat and water stress. Besides obvious signs of wilting, plants give off other distress signals like dull or droopy foliage, premature dropping of leaves and poor flower production.

Drought Tolerant Doesn't Mean Dull and Ugly

Many species of drought-tolerant plants live and thrive in our area. By choosing carefully, you can find drought tolerant species that flower with spectacular purples, blues, yellows, reds, pinks and bright whites. There are many companies that sell native wild flower mixes that contain drought tolerant annuals that will add spectacular color.



Figure 11
Drought Tolerant Plants

Many of the Water-wise Demonstration Gardens have spectacular examples of these plants. In addition, many non-native species of drought tolerant annuals can also be used, including pansies (purple, blue, yellow, white and fuchsia), petunias (white, pink, red, purple, blues and candy-stripped) and zinnia (every color of rainbow).

Save Water & Money - Part of the fun of landscaping is enjoying it. Drought-tolerant plants give you more time to do just that. By including water-smart plants in your landscape, the time spent maintaining your property can be significantly reduced. Not only can you reduce your water bill, but you can reduce maintenance costs. By focusing on plants that prefer Southern California's weather and soils, you reduce the expense of replacing less-hardy plants.

NATIVE PLANTS

After several centuries of carelessly importing plants from all over the globe, people in Southern California are rediscovering the many attractive and naturally drought tolerant native plant species available for them to use as an integral part of their outdoor living areas. Even more exciting is that many nurseries and garden stores are actively cultivating and selling native plant species, so the availability and selection is constantly improving. Much of this success is due to the many individuals and organizations who have dedicated themselves to the preservation and cultivation of native plants.



Figure 12
Antelope Valley California Poppy Reserve

Native plants are those that evolved naturally in any given area, in our case Southern California. More specifically, native plants have been defined to include only those species that were growing naturally in the area before humans introduced plants from distant places. Contrary to popular

belief, non-native plant species were not originally introduced by European colonists. Virtually all Native Americans who practiced any type of agriculture introduced non-native species, such as corn and squash, into other areas as they moved around. Europeans, however, substantially increased the invasion of new plant species by importing them from literally all parts of the globe.



Figure 13
California Fresh Water Marsh
Native Plant Community

Prior to humans, native plants typically grew in communities with species that were well-adapted to similar soil, moisture, and weather conditions. Some of the widespread communities locally included scrub and valley oak, tallgrass and shortgrass prairies, as well as freshwater and saltwater marshes. Additional plant communities occupied specialized niches, including savannahs, fens, bogs, flood plains and alpine areas.

Why Landscape with Native Plants

- Landscaping with native plants has many advantages, including:
- lower water use (native species, once established, are naturally drought resistant),
- better adapted to natural soil conditions,
- better suited to provide natural forage, cover and habitat for native wildlife, and
- more resistant to natural pests and diseases.

Native plant species have evolved and adapted to local conditions over thousands of years and are usually much more tolerant to the prevailing weather extremes at a given location. They have adapted to survive winter cold and summer heat, periodic drought, wild fires and high winds. Once established, most species require little or no additional irrigation beyond normal rainfall and because they typically grow more slowly, they generate much less yard waste. Native plant species are also well adapted to local soil

conditions, thriving without artificial fertilizers. Additionally, native plant species are generally more resistant to local pests and diseases, although invader pests and diseases may prove problematic. It is easy to see that native plant species are very well adapted for inclusion in "low-maintenance" gardens and landscapes.

Each native plant species is a member of a community that includes other plants, animals and microorganisms. The natural balance keeps each species in check, allowing it to thrive in conditions to which it has adapted, but preventing it from spreading uncontrolled. Thus, native species rarely become invasive, unlike plants imported from other areas.

Native plants provide food and shelter for birds, butterflies and other desirable wildlife. Many help to stabilize and hold the soil. Their root systems help rainfall percolate into the soil, reducing erosion and runoff and improving downstream water quality. Many of the hillsides in Southern California suffer from periodic landslides and severe erosion during the winter because imported trees and shrubs have shallow roots which do not anchor the soil on slopes particularly well. Native plant species often have much deeper penetrating root systems which are more effective at holding soil on slopes, often decreasing the possibility of landslides and erosional losses.

Native Plants Are Interesting

The diversity of native Southern California plants includes interesting flowers and foliage. Native shrubs and trees such as Manzanita and Valley Oak, provide a variety of heights, shapes and textures in the landscape. Ground covers and low growing shrubs such as Island Bush Poppy, Wild Lilac and California Dutchman's Pipe offer a diversity of color and texture which grow well in planting beds and as borders of landscaped areas. In addition, Southern California has many annual and perennial flowers such as Matalija Poppy, Coral Bells, and Western Columbine offer opportunities for vibrant color while remaining drought tolerant. Another benefit of native plants is their historical and cultural importance. Many native plant species have played a significant role in Native American culture, or in European exploration and settlement. A number of species have been reported to have value as food or medicine, while others have been used as fiber for textiles and rope or coloring and dye for various domestic purposes. Native plants offer a tangible link to our common heritage, and provide a bridge to our collective futures.