



San Diego County
Water Authority



A Homeowner's Guide to a WaterSmart Landscape



This guide is intended to be used for general informational purposes; the guide does not take the place of professional advice. Please consult with appropriate landscape professionals for site-specific advice prior to making changes to your landscape or irrigation systems.

Guidelines made possible by:



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THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA

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Getting Started



A Step-by-Step Process

to a Beautiful and Water Efficient Landscape

We're All in this Together

Using water efficiently is a way of life and an important responsibility that comes along with the benefits of living in a beautiful, Mediterranean climate like San Diego County. A WaterSmart landscape is all about rethinking the way we use our limited water resources, and making smart choices to reduce outdoor water by designing beautiful and appropriate landscapes for our region. Working together, we can all help ensure a reliable water supply and keep San Diego County vibrant, prosperous and naturally beautiful ... now, and for generations to come.

As of January 1, 2010, all jurisdictions within the State of California adopted a Water Efficient Landscape Ordinance to comply with Assembly Bill 1881. This step-by-step guide is intended to assist homeowners in meeting the spirit of these ordinances. For compliance with specific requirements relative to where you live, including any relevant landscape permits, please contact your local land use agency.

WaterSmart Landscape Makeover Program

The WaterSmart Landscape Makeover Program is an award-winning educational program developed in 2012 by the San Diego County Water Authority in conjunction with MiraCosta College and the San Diego Botanic Garden. The program is based on the first edition of this Homeowner's Guide and is designed to empower homeowners with the skills and knowledge necessary to convert a turf area into a WaterSmart landscape.

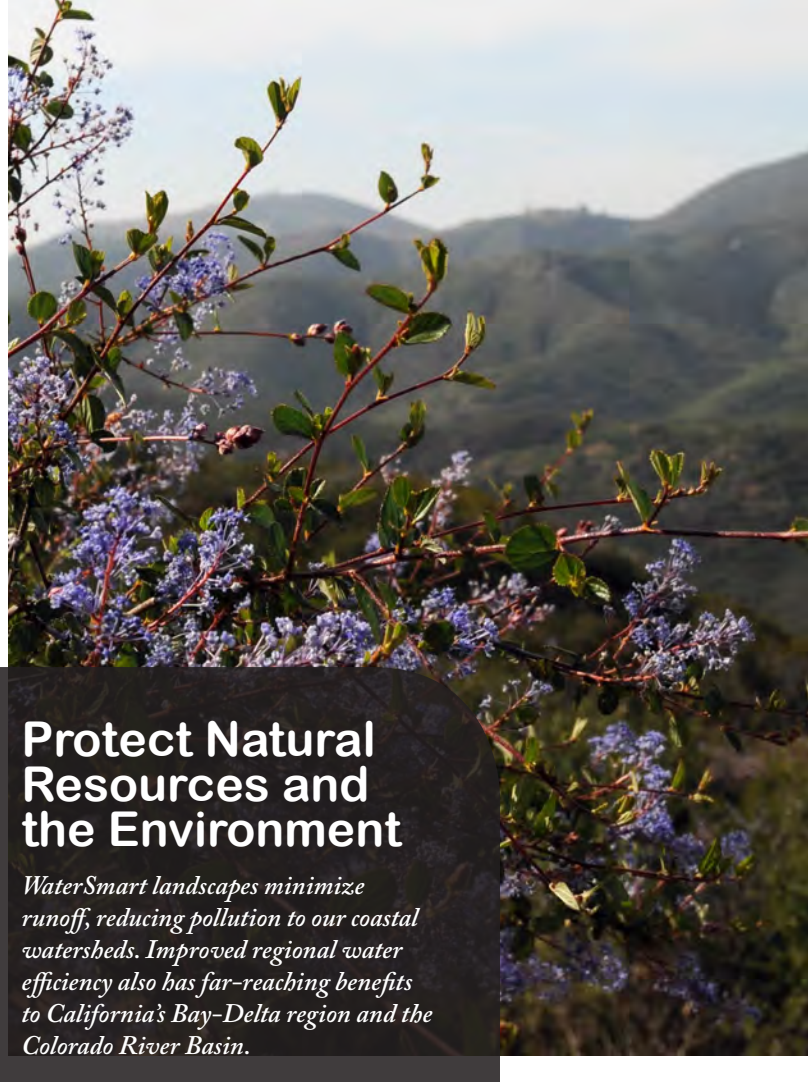
If you're reading this guide and attending the makeover program classes, then you're one step closer to a better way to beautiful. You're on your way to being WaterSmart!





Beautify Your Property

A well-designed WaterSmart landscape enhances the appearance of your property, transforming it into a vibrant neighborhood showcase.



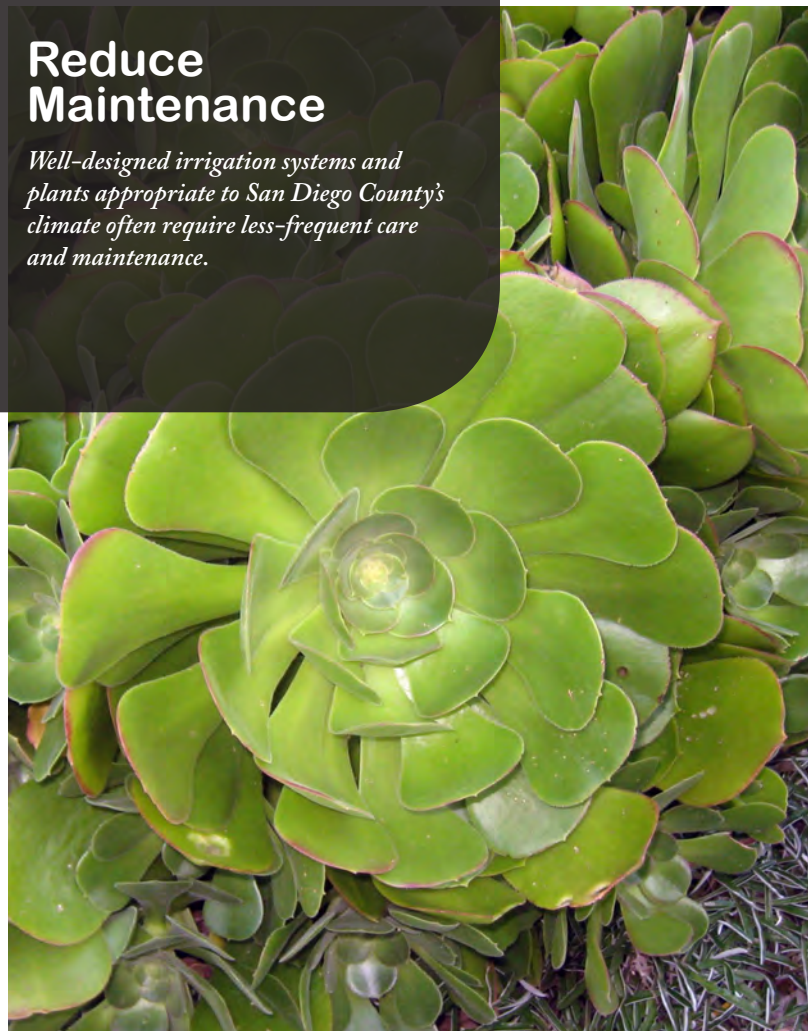
Protect Natural Resources and the Environment

WaterSmart landscapes minimize runoff, reducing pollution to our coastal watersheds. Improved regional water efficiency also has far-reaching benefits to California's Bay-Delta region and the Colorado River Basin.



Save Water

WaterSmart landscaping uses less water than traditional landscaping, which can save you money on your water bill.



Reduce Maintenance

Well-designed irrigation systems and plants appropriate to San Diego County's climate often require less-frequent care and maintenance.

What is a WaterSmart Landscape?

A WaterSmart landscape includes:

Water Efficient Design

Proper landscape design is a key element. Begin with an overall target of how much water you want to save on your project.



This guide can help you identify a WaterSmart target for your landscape.

Efficient Irrigation

Incorporate WaterSmart irrigation components – including Smart controllers, pressure regulators, rotating nozzles and drip – into your irrigation system to maximize water use efficiency.



Drip emitters are the most efficient method of irrigation.

Climate Appropriate Plants

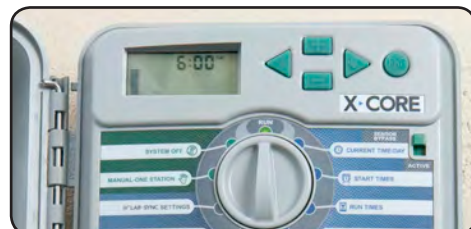
Select plants that naturally thrive in San Diego County's Mediterranean climate, and are also appropriate for your specific soil and microclimate.



Succulents are typically very low water use plants.

Appropriate Maintenance and Irrigation Management

Know the needs and requirements of your water efficient landscape, and strive to manage water use within an established water budget. Monitor systems and make any repairs promptly.



Seasonal maintenance checks and controller updates can help conserve water.

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Top left: Bougainvillea sp./Bougainvillea (low water use)

Top right: Ceanothus sp./California Lilac (low water use)

Bottom left: Euryops pectinatus 'viridis' / (low water use)

Bottom right: Aeonium sp./Canary Island Rose (low water use)

Your **Path** to Achieving a WaterSmart Landscape

Achieving a WaterSmart landscape requires careful planning and implementation, but the many benefits you will derive – which include improving the beauty of your property, reducing maintenance, minimizing water pollution due to runoff, and conserving water – are well worth the effort.



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**Identify Your
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**Design Your
WaterSmart
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5

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6

**Care for Your
WaterSmart
Landscape**

The following pages will guide you through the steps to creating a WaterSmart landscape.

Note: If you're not ready to start the full landscape upgrade right now, you can start by upgrading just one portion of your yard at a time. Or if you're just looking for tips to maximize water savings in your existing landscape, skip to "Step 6 – Care for Your WaterSmart Landscape" for recommendations on how to **save water in your landscape now!**

1

Identify Your Landscape Target

As a homeowner, you have the power to significantly improve your home's water efficiency. Cool season turf grass is one of the highest water-using plants in our region. Replacing it with a WaterSmart landscape is a great way to reduce your water use. Whether you want to do a complete remodel or update only a portion of your landscape, the following section will help you

identify what type of landscape will meet your needs and maximize your landscape's water savings potential.

The amount of water savings your WaterSmart landscape can offer is determined both by the water use characteristics of the planting, as well as the efficiency of the irrigation system. Select your preferred plant and irrigation type from the list below and follow the simple calculations to verify that the combination of **planting** and **irrigation** you selected will meet the intent of the water conservation guidelines in the State's Model Water Efficient Landscape Ordinance.



An example of a low to moderate water use garden.



An example of a low water use garden.



An example of a very low water use garden.

Planting

Low to moderate water use plants

A low water use garden with some moderate water use accent plants, and up to 10% turf (or other high water use plants).

- 45% low water use
- 45% moderate water use
- 10% high water use

Low water use plants

A low water use garden with no more than 10% turf (or other high water use plants).

- 90% low water use
- 10% high water use

Very low water use plants

A very low water use garden with a mix of very low and low water use plants.

- 50% very low water use
- 50% low water use

See additional garden photos on pages 16 and 17.

Irrigation

Low efficiency irrigation

Conventional spray irrigation:

Conventional spray heads apply water faster than most soils can absorb it, and they produce smaller water droplets that are susceptible to wind.

Impact rotors: Impact rotors are one of the least efficient methods of irrigation.

They are quickly being replaced by higher efficiency options.

Moderate efficiency irrigation

Rotator nozzles: Best suited for spaces 8-30 feet wide.

Gear rotors: Best suited for areas 25 feet wide and larger.

High efficiency irrigation

Drip emitters and in-line emitters:


Drip irrigation is the most efficient way to water perennials, shrubs, trees, and new turf. Drip systems apply water slowly so runoff is not an issue. You can leave the water on long enough to reach the deep roots of shrubs and trees.

Bubblers: Best suited for trees and some small shrub areas.

Micro-spray: Best suited for tree and shrub areas of smaller size.

Note: See the definitions in Appendix C to compare the features of each irrigation type.

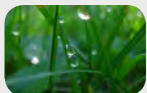
WaterSmart Matrix

Planting	Irrigation	Low efficiency irrigation	Moderate efficiency irrigation	High efficiency irrigation	Note: The matrix is based on the State Model Water Efficient Landscape Ordinance water use calculations for a 1,000 to 3,000 square foot size landscape, and is provided as a simple rule of thumb for sites in San Diego County. As shown, the only combination of planting and irrigation that does not achieve the water conservation goals of a WaterSmart landscape is low to moderate water use shrubs with a conventional spray irrigation system. The conventional spray irrigation is not recommended, but it is shown to demonstrate that with the right plant selection and the use of a smart controller, you can still achieve a WaterSmart landscape.
		Conventional Sprinklers Impact Rotors <i>IE = 0.55*</i>	Rotator Nozzles Gear Rotors <i>IE = 0.70*</i>	Drip Emitters Bubblers Micro Spray <i>IE = 0.80*</i>	
Low to moderate water use plants 45% Low water use 45% Moderate water use 10% High water use <i>average PF = 0.40*</i>		not WaterSmart	★	★★★★	
Low water use plants 90% Low water use 10% High water use <i>average PF = 0.26*</i>		★★★★	★★★★★	★★★★★	
Very low water use plants 50% Very Low water use 50% Low water use <i>average PF = 0.15*</i>		★★★★★	★★★★★	★★★★★	
WaterSmart Star Rating  <p>Compliant with the water conservation ordinance. → Maximum water savings potential. Congratulations!</p>					*See Water Use Calculation Worksheet in Appendix A for definitions and assumptions made for IE (irrigation efficiency) and PF (plant factor).

Potential Water Savings

Converting cool season turf to WaterSmart planting can have a big impact on water use in the warmer microclimates of San Diego County:

High water use cool season turf



46-50 gallons per square foot per year

vs.

Low water use plants



9-12 gallons per square foot per year

Landscape Target

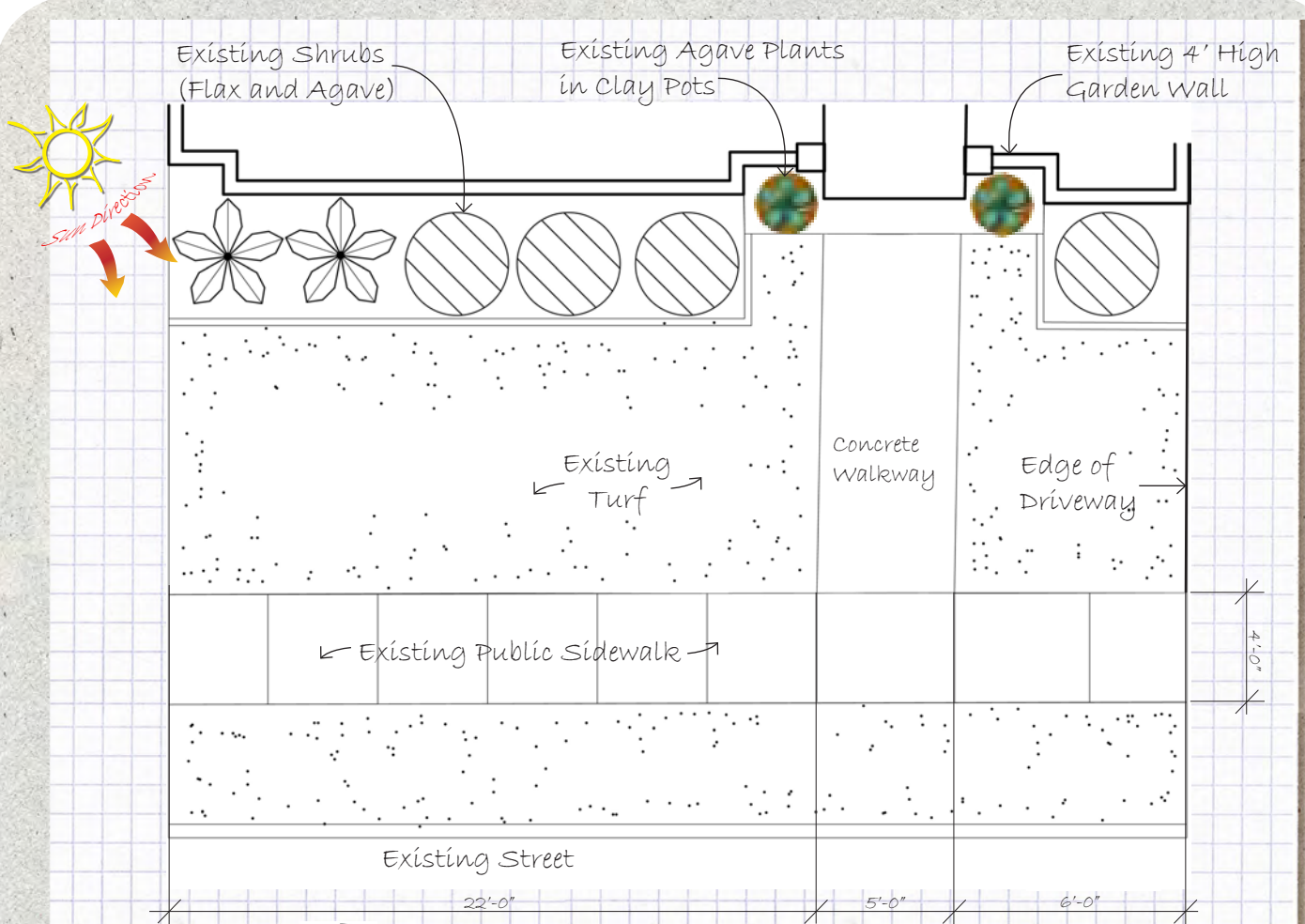
My WaterSmart landscape target is:

(Select ★ to ★★★★★ WaterSmart landscape)

Now that you have identified your ideal planting style and the type of irrigation required to achieve your desired water savings, it's time to review the steps you'll need to take to make your landscape upgrade a reality.

Case Study - From Turf To WaterSmart

The following case study is an example of a San Diego residence that converted approximately 625 square feet of turf to a WaterSmart landscape. Follow this case study through the guide as it illustrates the steps to a WaterSmart landscape.



Plot Plan
not to scale

Put it on paper. A little upfront site planning will make the whole project easier.

Notes:

Soil Condition - Light Brown Color, Seemed to be loam soil. Will need a soil sample analysis to determine.

Drainage - 2" per hour

Total Landscape Area - 625 square feet

Target Landscape Type - ★★ WaterSmart landscape with Low water use plants and micro-spray irrigation.

Potential Water Savings - 5865 Gallons/year (per Water Use Calculation worksheet Appendix A)



San Diego Residence
-Measure all distances to create a plot plan-



2 Create a Basic Plot Plan

Starting with a sketch of your existing landscape will help you visualize your future WaterSmart landscape. Use graph paper with squares that are 1/8" or 1/4" in size to draw your plot plan so that one square equals one foot in plan view (looking down at the property). Locate key existing elements such as property limits, walkways, trees, sun patterns, and anything else particular to your landscape. See the case study on page 10 of a San Diego home where the landscape was successfully converted from turf to a WaterSmart landscape. Below are some tips to help you create your basic plot plan:

- Note any existing hardscape elements that you want to save, such as sidewalks and walls.
- Note any existing landscape that you want to save such as mature trees and shrubs.
- Include private property and public right of way areas, if known.
- Locate windows that have views out to your yard.
- Take note of natural drainage features. Preserving these and limiting the use of impervious surfaces within the landscape will minimize water waste due to runoff.

Do It Yourself or Hire a Professional?

If you choose to design, implement and/or maintain your landscape yourself, this guide can help you through each step. If you're interested in hiring a professional, you can use this guide as a reference to help understand the steps that will be involved, and give you the tools you need to work through the project with your professional. Here's how a professional can help:

Landscape Architect. A professional, licensed by the State of California, who can design and develop detailed construction plans and specifications. A Landscape Architect is not licensed to provide installation/construction services. For more information, visit the American Society of Landscape Architects website (www.asla-sandiego.org) and the State Licensing Board website (www.latc.ca.gov/consumers/selecting.shtml).

Landscape Designer. A person who provides landscape design and horticulture services, such as design concepts, planting plans, and selection of materials. For more information, visit the California Association of Professional Landscape Designers website (www.apldca.com).

Landscape Contractor. A professional, licensed by the State of California, to install/construct and maintain landscapes. If a Landscape Contractor installs a project, they can also design it. For more information, visit the California Contractors Association website (www.clcasandiego.org) and the State Licensing Board website (www.cslb.ca.gov/Consumers/HireAContractor).

Irrigation Designer. A person who provides irrigation design services. Irrigation designers may achieve certification with the Irrigation Association. Visit their website for more information (www.irrigation.org).

Tips on Hiring a Professional

Refer to our [eGuide to a WaterSmart Lifestyle](#) for additional information at WaterSmartSD.org.



3 Evaluate Your Site

Spend time in your landscape and make notes about the site. Identify site elements and the opportunities and constraints that will help you make design decisions as you start the design process. Some elements to evaluate are:

- ❑ **Microclimates.** Note areas that are sunny or shady in the morning and areas that are sunny or shady in the afternoon.
- ❑ **Views.** Note any views that you would like to preserve and/or elements you would prefer to hide.
- ❑ **Soil type.** A simple way to get a soil analysis is to contact your local nursery and have them send the soil out for testing. Or you can purchase a home soil testing kit for about half the price. Either way, the results will identify necessary soil amendments and assist in determining the best plants for the site. A mix of sand, silt, and clay in similar proportions is called “loam”, but often one or two soil types dominate. You can also perform a squeeze test to quickly determine your soil type. Do-it-yourself soil tests can be found in Appendix D.
- ❑ **Drainage.** Perform the drainage test described in Appendix D to see how quickly your soil absorbs and drains water. Although you will prepare your soil based on your soil test results, some of the original soil characteristics may remain so it is a good idea to select plants that can withstand the characteristics of your soil. For example, if you have poor drainage, you should select plans that can tolerate that condition.



Get to know your soil and how to care for it and you will be rewarded with healthier soil and easier maintenance.

4

Design Your WaterSmart Landscape

Layout:

Consider creating a landscape master plan. Even if you don't plan to implement your entire landscape plan at one time, having a master plan of your overall landscape design will help you keep working toward your WaterSmart landscape target through all phases.

- ❑ **Identify different use areas.** Identify areas for kids, dogs, entertaining, vegetable gardens, etc. This will help you define the areas that can be planted gardens and other areas that need to be active turf or hardscape.
- ❑ **Consider alternatives to traditional turf grass.** Because cool season turf grass is one of the highest water use plants, it is best to incorporate alternatives to turf such as gravel or decomposed granite paving, bark mulch, or low water use groundcover, whenever possible. If an area of turf is important, especially for active play, utilize a more drought tolerant variety of grass in the warm season turf category.
- ❑ **Budget.** Keep your budget in mind when locating different elements in your landscape. See the case study budget and tips on page 20.

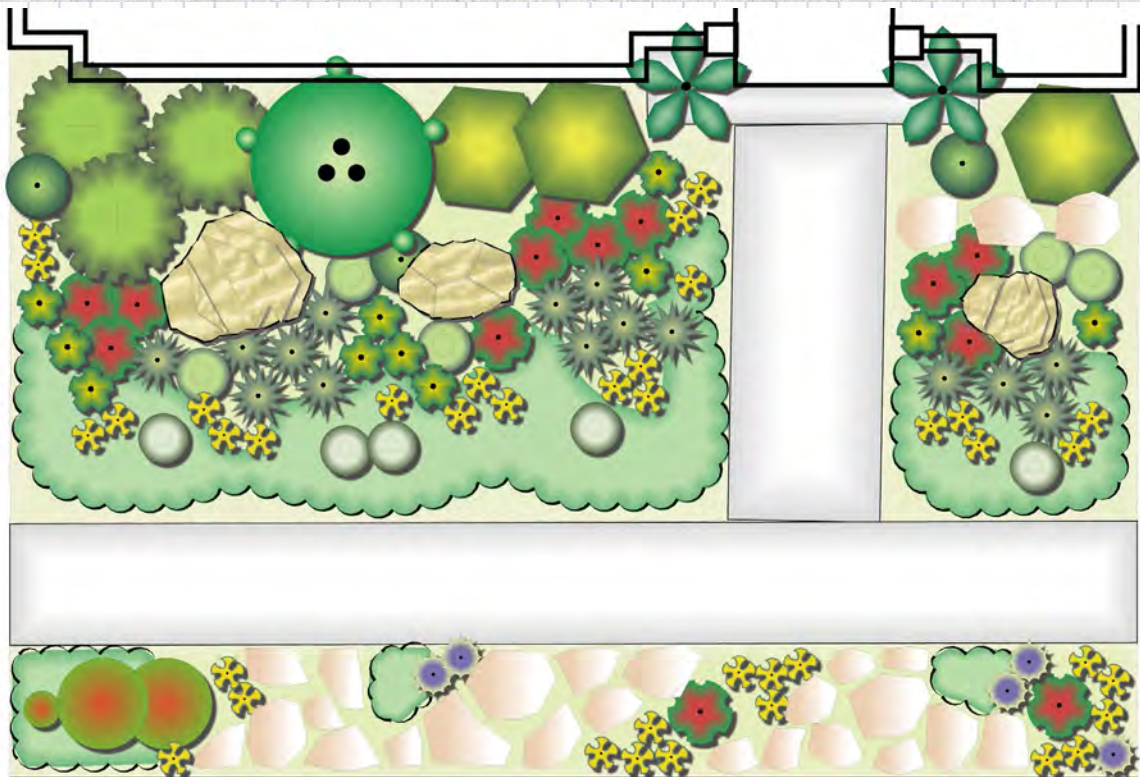
Planting Design:

Before you start selecting actual plants for your landscape, envision the overall planting design. Determine the landscape style and think in terms of plant size and characteristic (i.e. large background shrub, small colorful accent shrub, etc.), before moving into actual plant selection.















- ❑ **Landscape theme.** Take some time to consider the style of landscape you find appealing that fits your house, neighborhood, and lifestyle. A heavy tropical look is often desirable, but requires careful low water use plant selection for our arid region. There are dozens of themes and styles to choose from that include plants from our region or areas of the world with similar climatic conditions. A selection of sample plant palettes, including Mediterranean Effect, Contemporary Effect, Native Garden Effect, Asian Effect, and Tropical Effect are included in Appendix E.
- ❑ **Design for access and views.** Plants can be used to screen views and direct access. Are there any blank walls or fences that would look better with a nice looking shrub in front of them? You might want to frame the view out a window but you probably don't want a large shrub in front of the window blocking the view. Is access from the side of the house needed to bring out the garbage cans to the curb? If so, make sure you accommodate that in the design.



Case Study - Planting Design



Planting Legend

Shrubs	Botanical / Common Name	Water Use	Mature Size (H x W)
	Agave attenuata / Agave	Low	3' x 3'
	Aeonium canariense / Canary Island Aeonium	Low	2' x 2'
	Aeonium 'Mint Saucer' / Green Aeonium	Low	2' x 2'
	Arctostaphylos densiflora 'Howard McMinn' / Howard McMinn Manzanita	Low	6' x 6'
	Callistemon viminalis 'Little John' / Dwarf Weeping Bottlebrush	Moderate	3' x 3'
	Ceanothus 'Concha' / California Lilac	Very Low	6' x 6'
	Iris douglasiana / Douglas Iris	Moderate	2' x 2'
	Othonna capensis / Little Pickles	Low	1' x 2'
	Salvia greggii / Autumn Sage	Low	3' x 3'
	Senecio barbertonicus / Succulent Bush Senecio	Low	4' x 4'
	Tetranneuris acaulis / Angelita Daisy	Low	1' x 1'
	Yucca pallida / Twistleaf Yucca	Low	2' x 2'
	Existing Shrub	Very Low	
	Dymondia margeratae / Dymondia	Low	2' x 1'

Planting Plan

Not to scale



Callistemon viminalis 'Little John'
 Note: As you prepare to upgrade to your WaterSmart landscape, collect photos of landscapes and plants that inspire you to help guide your design.

Planting Design (cont'd):

- ❑ **Tree placement.** Typically a planting design will include a tree or two for shade and to provide a canopy. Placing a deciduous tree on the south or west side of your home will shade the house during the summer to keep it cool and allow more light and sun exposure in the winter.
- ❑ **Shrub placement.** Shrub and groundcover planting is typically designed with a variety of heights. Medium size (3 to 4 foot) shrubs are usually placed closer to the house to create a “foundation” or back drop. Smaller shrubs are then placed in front of the foundation planting and low groundcovers in the area closest to the sidewalk or street. Accent shrubs that provide a special texture, color or flowers should be placed so they provide interest and focus views on locations in the landscape. Highlight your entrance walk with special accent plants. This places a higher emphasis on your entry, which is where you want visitors to be directed to. Be bold and have fun. Don't be afraid to express your individual tastes.
- ❑ **Water features and higher water use plants in the garden.** Water has been a precious resource throughout history in arid regions of the world. This perspective has been integrated into Mediterranean landscapes by utilizing water only in the areas that are the most important. If you have some high water use plants that you particularly want to include, they can be used. However, as a general rule of thumb, your total landscape should include no more than 10% high water use plants or water features. Don't forget that any higher water use plants should be on a separate irrigation valve so that you can water them differently than the rest of the garden. Water features were also historically used in Mediterranean landscapes as the sound of water is pleasant and calming. The water area of the fountain will lose water at about the same rate as cool season turf grass or another high water use plant. Minimize the square footage of open water, and a water feature can fit well into the WaterSmart landscape.

There's nothing like experiencing the beauty, texture and scents of a WaterSmart garden in person. San Diego County is blessed with two regional gardens that are dedicated to showcasing climate-appropriate plants and landscapes. Take advantage of tours, classes and one-on-one design consultations at the San Diego Botanic Garden in Encinitas and The Water Conservation Garden in El Cajon. For more information visit their websites at www.sdbgarden.org and www.thegarden.org.



Ceanothus spp./California Lilac



Gaillardia grand./Blanket Flower



Grevillea 'Moonlight'/Grevillea



Salvia spp./Sage



Cistus x purp./Orchid Rockrose



Achillea spp./Yarrow



Heteromeles arbutifolia / Toyon



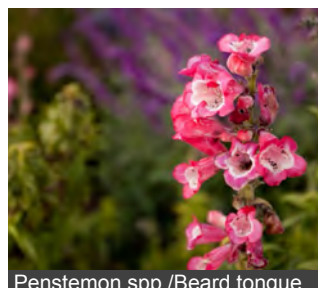
Leonotis leonurus / Lion's Tail



Romneya coulteri/Matilija Poppy



Callistemon spp./Bottlebrush



Penstemon spp./Beard tongue



Rosemary officinalis/Rosemary

Plant Selection:

From your WaterSmart landscape target identified in Step 1, select plants that fit within that plant water use category to ensure you meet your WaterSmart water conservation goals.

- ❑ **Select WaterSmart plants.** Select plants that are locally native or from similar climatic regions. See the garden ideas on these two pages for examples of WaterSmart California landscapes.
- ❑ **Design for mature plant size.** Allow enough space for the plants you select to grow to their full size to avoid overcrowding or the need for excessive pruning.
- ❑ **Growing conditions.** Select plants suited for your microclimate, soil type, and soil drainage to achieve optimum plant growth.
- ❑ **Minimize turf.** Limit the amount of turf in your design as much as possible. If you choose to incorporate turf, consider a warm season turf that uses less water than a traditional cool season turf. Warm season turf such as Hybrid Bermuda or UC Verde Buffalo Grass thrive in the hot months of the year and naturally go dormant in winter. Another less thirsty grass to consider is *Carex praegracilis*/California Field Sedge.
- ❑ **Group plants according to their water use.** If you choose to include plants that are not classified as very low or low water use, be sure to group these moderate or high water use plants together. Grouping plants of similar water use together, known as planting in hydrozones, makes it easier to irrigate efficiently by letting you concentrate additional water only where it is needed.



Ceanothus sp./California Lilac (low water use)

Low to Moderate Water Use Planting



Low to moderate water use plants category should include a mix of low and moderate water use plants with no more than 10% turf or other high water use plants.

45%

Low water use

45%

Moderate water use

10%

High water use

Mediterranean Effect

Botanical Name/Common Name	Water Use
Trees	
<i>Arbutus 'Marina'</i> /Marina Strawberry Tree	Low
<i>Chamaerops humilis</i> /Mediterranean Fan Palm	Moderate
<i>Laurus nobilis</i> /Sweet Bay	Low
<i>Olea europaea 'Swan Hill'</i> /Fruitless Olive	Low
Shrubs	
<i>Agave attenuata</i> /Agave	Low
<i>Aloe striata</i> /Coral Aloe	Low
<i>Bougainvillea 'Crimson Jewel'</i> /Bougainvillea	Low
<i>Distictis buccinatoria</i> /Blood-red Trumpet Vine	Moderate
<i>Feijoa sellowiana</i> /Pineapple Guava	Low
<i>Lavandula a. 'Munstead'</i> /English Lavender	Low
<i>Rosmarinus officinalis</i> /Upright Rosemary	Low
<i>Salvia leucantha</i> /Mexican Sage	Low
Groundcover	
<i>Rosmarinus officinalis 'Prostratus'</i> /Trailing Rosemary	Low
<i>Senecio mandraliscae</i> /Blue Chalk Sticks	Low
<i>Thymus serpyllum</i>	Moderate
Turf	High

Low to moderate water use plants with:

Low efficiency irrigation

No Stars

Moderate efficiency irrigation



High efficiency irrigation



Low Water Use Planting



Low water use plants category should include predominantly low water use plants with no more than 10% turf or other high water use plants.

90%

Low water use

10%

High water use

Contemporary Effect

Botanical Name/Common Name	Water Use
Trees	
Agonis flexuosa 'After Dark'/Peppermint Willow	Low
Cercidium x 'Desert Museum'/ Desert Museum Palo Verde	Very Low
Shrubs	
Agave attenuata/Agave	Low
Aeonium 'Mint Saucer'/Green Aeonium	Low
Arctostaphylos densiflora 'Howard McMinn'/ Howard McMinn Manzanita	Low
Ceanothus 'Concha'/California Lilac	Very Low
Euphorbia tirucalli 'Sticks on Fire'/ Pencil Tree	Very Low
Othonna capensis/Little Pickles	Low
Phormium tenax/New Zealand Flax	Low
Salvia greggii/Autumn Sage	Low
Senecio barbertonicus/Succulent Bush Senecio	Low
Tetranuris acaulis/Angelita Daisy	Low
Yucca pallida/Twistleaf Yucca	Low
Groundcover	
Dymondia margaretae/Dymondia	Low
Turf	High

Low water use plants with:

Low efficiency irrigation



Moderate efficiency irrigation



High efficiency irrigation



Very Low Water Use Planting



Very low water use plants category should include a mix of low and very low water use plants, such as California native plants or succulents.

50%

Very low water use

50%

Low water use

Native Garden Effect

Botanical Name/Common Name	Water Use
Trees	
Chilopsis linearis/Desert Willow	Very Low
Quercus agrifolia/Coast Live Oak	Low
Shrubs	
Agave shawii/Shaw's Agave	Low
Arctostaphylos 'Sunset'/Sunset Manzanita	Low
Ceanothus 'Concha'/California Lilac	Low
Dudleya brittonii/Giant Chalk Dudleya	Very Low
Encelia californica/California Encelia	Very Low
Galvezia speciosa/Island Snapdragon	Very Low
Heteromeles arbutifolia /Toyon	Very Low
Muhlenbergia rigens/Deer Grass	Low
Rhus integrifolia/Lemonade Berry	Very Low
Salvia clevelandii/Cleveland Sage	Very Low
Low Shrubs and Groundcover	
Baccharis pilularis 'Pigeon Point'/ Dwarf Coyote Brush	Low
Ceanothus g. horizontalis/Carmel Creeper	Very Low

Very low water use plants with:

Low efficiency irrigation



Moderate efficiency irrigation



High efficiency irrigation



Irrigation Design:

Start by reviewing the target irrigation type you identified in Step 1; this will help you decide which irrigation type to use. Whether you are working with a professional designer, or are doing the project yourself, the following checklist will help you keep track of the main design decisions involved in irrigation design.

- ❑ **Water pressure.** Check your available water pressure to ensure that you choose the right irrigation equipment for your home. To determine your water pressure, follow one of these two steps: (1) Contact your local retail water purveyor and request a pressure reading. (2) Check your pressure with a gauge (available at your local landscape supply store) at a hose bib. If your house has a hose bib located on the water line before the line enters the house, test the pressure at that location as it will tell you the available pressure before water passes through the pressure regulator for the house. It is important to identify your available water pressure so you can select equipment that is optimized for that operating pressure. If your pressure is high (above 70 psi), a pressure regulator may be needed to avoid misting. If your pressure is low (under 30 psi), drip irrigation would be the ideal choice as it has a lower operating pressure.
- ❑ **Existing conditions.** Evaluate your existing irrigation system and determine if it can be maintained in its current condition or if you need to upgrade the system. Some irrigation systems can be upgraded by simply changing nozzles, converting to drip emitters, or adding a smart controller, while others may need to be completely redesigned. The following is an summary of the range of irrigation options you can consider.
- ❑ **High efficiency irrigation.** The most efficient method to deliver water to plants is low flow irrigation which delivers water from the valve through a **filter** and then through a network of lateral pipes, and sometimes flexible tubing, to the individual emission devices such as **drip emitters, in-line drip emitters** or **bubblers**. **Pressure compensating devices** are always the most efficient option. Low flow irrigation is a good choice for trees and shrub areas and should be used in any landscape areas next to hardscape and in areas less than 8 feet wide to prevent runoff from overspray. When using drip emitters, reduce maintenance and ensure long term durability by selecting good quality tubing and designing for at least two emitters per shrub.
- ❑ **Moderate efficiency irrigation.** The next most efficient types of irrigation include **rotator nozzles** (typically for spaces 8 to 30 feet in size) and **gear rotors** (typically for spaces 25 feet and larger). These are good choices for turf areas or larger shrub areas. If you use rotator nozzles it is worth the investment to get good quality nozzles. Check with your local commercial irrigation supply store to ensure you get the most efficient rotator nozzles for your project.
- ❑ **Low efficiency irrigation.** The least efficient types of automatic irrigation include **conventional spray irrigation** and **impact rotors**. Installing a new system with low efficiency irrigation is not recommended, but if you have an existing conventional spray system, you can retrofit with new rotator nozzles as noted above.

Note: To compare the features of each irrigation type shown in bold above, see the definitions in Appendix C.



Drip irrigation can be installed at grade or a few inches below the surface of the soil.



Weather-based controllers often have a sensor that should be mounted outside, free of obstructions, and be connected back to the controller.

- ❑ **Smart controller.** Upgrade to a **smart controller** (often called a weather-based controller), which is an automatic controller (also called a timer or clock) that is either weather-based or has a moisture detection system that automatically adjusts your watering schedule in response to environmental changes. Smart controllers have the ability to turn off your sprinklers when it rains and increase the frequency and/or duration of watering in hotter weather. Locate the controller in a place that is easy for you to access, such as the garage.
- ❑ **Irrigation layout.** The goal of WaterSmart landscape irrigation is to apply water as efficiently as possible. This means using low flow drip or bubblers whenever possible and in areas with overhead sprays, provide even coverage to ensure maximum efficiency. Once you have determined what type of irrigation you would like to use, divide your yard into zones and note what type of irrigation you plan to use in each zone. Contact some of the major irrigation manufacturers to obtain an irrigation design guide which will help you with the specifics of your irrigation layout. Some irrigation manufacturers even offer free irrigation design services.

Layout Tips

For bigger projects it can be advantageous to use more than one type of irrigation (i.e. large rotors on a back slope, and drip irrigation in all other areas). **Important:** If you use more than one type of irrigation, do not mix different sprinkler types in one zone.

Other key elements to locate on your layout plan are the locations of mainline pipes (pressurized) and lateral line pipes (non-pressurized, except when valves are open), connection to your household water supply, and backflow preventer, if required.

Verify Your New Landscape Water Use:

Now that you have designed your WaterSmart landscape, it is important to double check to make sure your design meets the target landscape water use you set in Step 1, and, if necessary, adjust the design to meet the target to maximize water savings.

- ❑ **Verify your overall plant water use.** Review your planting design and determine, based on area, what percentage of shrubs are very low, low, moderate, or high water use. If the planting you selected does not fit exactly into one of the categories below, adjust the plant selection so that it does, or select the category that represents the higher water use category.
- ❑ **Verify your overall irrigation efficiency.** Review your irrigation design and note below what type of irrigation you selected. If you are using more than one type of irrigation, you can use the more detailed calculation worksheet provided in Appendix A.

Planting	Irrigation		
	Low efficiency irrigation	Moderate efficiency irrigation	High efficiency irrigation
Low to moderate water use plants	not WaterSmart	★	★★
Low water use plants	★	★★	★★★
Very low water use plants	★★	★★★	★★★★

WaterSmart Star Rating

Note: If you choose a design that does not fit the parameters above, you can still create a WaterSmart landscape. Just follow the step-by-step instructions in Appendix A to calculate your home's water use.

Case Study - Budget

Below is an overview of the budget used for the San Diego residence in our case study. Note that costs will vary depending on the size of the site, type of materials, and level of craftsmanship employed.

The following example is based on 2015 unit costs and represents costs for material and labor to install each item.

Cost Estimate, 2015

Demolition/Soil Preparation	Quantity	Unit	Price	Total
Clear and Grub	630	Square Feet	\$0.50	\$315.00
Soil Test	1	Each	\$95.00	\$95.00
Soil Amendments/Fine Grading	3	Cubic Yard	\$140.00	\$420.00
Subtotal				\$810.00

Hardscape	Quantity	Unit	Price	Total
Install Boulder Accents	3	Each	\$400.00	\$1,200.00
Install Flagstone Paving on Concrete Base	70	Square Feet	\$30.00	\$2,100.00
Subtotal				\$3,300.00

Irrigation	Quantity	Unit	Price	Total
High Efficiency Irrigation Upgrade <i>(includes 50 micro-spray heads, 200 linear feet of PVC pipe, 50 swing joints with fittings, 20 pipe fittings, 3 above ground atmospheric vacuum breaker valves, and 1 isolation ball valve)</i>	555	Square Feet	\$2.50	\$1,387.50
Smart Controller, Weather-based <i>(includes 18 gauge multi-strand wiring from controller to valves, waterproof wire nuts, and rain shutoff device)</i>	1	Each	\$300.00	\$300.00
Subtotal				\$1,687.50

Landscaping	Quantity	Unit	Price	Total
1 Gallon Shrubs	94	Each	\$12.00	\$1,128.00
5 Gallon Shrubs	9	Each	\$35.00	\$315.00
Flats of Groundcover	2	Each	\$30.00	\$60.00
Mulch	3.5	Cubic Yards	\$75.00	\$262.50
Subtotal				\$1,765.50
Total				\$7,563.00

Note: Prices include materials and labor.

Budget Tip: In the case study cost estimate, the homeowners designed and will maintain the landscape themselves, so the cost of design and maintenance is not included. If you plan to hire a professional for any services, be sure to budget for those costs and account for any available rebates as well.

5

Implement Your Plan

Now it is time to begin the physical construction work of upgrading your landscape.

Demolition:

Remove existing turf or other materials from the areas that you plan to renovate. Reclaiming an area of unwanted turf requires diligence. No matter what method of turf removal used, weeding and/or herbicide application will be needed every two weeks for the first three months.

- ❑ **Natural turf removal.** A natural way to remove turf and preserve the soil's ecology is to strip the turf, and for the next two weeks, water the area to encourage grass to re-sprout, and hand pull all new growth.
- ❑ **Sheet mulching.** Rather than removing turf and taking it to the landfill you can compost it in place. Begin by removing several inches of turf and soil from the edges near your hardscape. Wet the turf area and cover with several layers of newspaper. Water again and cover with cardboard. Water again and cover with three inches of shredded mulch. The optimal approach is to allow several months for the soil microbes to decompose the turf and turn it into friable soil for plants.
- ❑ **Solarization.** Another natural alternative is solarization. Solarization works best in the spring or summer because it involves covering the turf with rolls of plastic and allowing the sun to heat up the soil to levels that will kill the turf and weed seeds. Make sure the cover is airtight with no holes and leave in place for six to eight weeks.
- ❑ **Turf removal with herbicide.** If you choose to use an herbicide, consult with your local landscape supply store for best use practices. Since Bermuda grass and some other grasses are dormant in the winter, they must be treated when they are actively growing in the remainder of the year (May to October).



Sheet mulching is a natural turf removal option.



Case Study – Installation



San Diego Residence
-Rock Placement-



San Diego Residence
-Irrigation Installation-



San Diego Residence
-Plant Placement-



San Diego Residence
-Planting Installation-

Grading:

- ❑ **Grading.** Set the soil level so that it will direct water away from the house. To help slow down water runoff from your garden, try creating small depressions where water is allowed to pool and slowly percolate into the soil. The more you slow the water down or hold it on site, the more you improve water quality in your area, and downstream at local beaches.
- ❑ **Reduce runoff.** Runoff carries with it soil particles and pollutants. Reduce runoff by using mulch.

Soil Preparation:

Now that you have removed unwanted vegetation, it is time to condition your soil.

- ❑ **Soil amendments.** Amendments should be selected based on your soil analysis recommendations and should be tilled into the top layer of soil. **Compost** (15-30% by volume) and fertilizer are typical amendments. The goal is to achieve healthy soil containing microbes which feed plants, improve drainage, and increase the natural water holding capacity of the soil.

Irrigation Installation:

Now that you have selected your irrigation equipment, drawn a plan showing the layout, and amended the soil, you can start to implement the design.

- ❑ Read the instructions from the manufacturer and familiarize yourself with the parts.
- ❑ Starting from the main connection to the water line, dig trenches for all the pipes according to your irrigation plan. Ideally, the main connection to the water line will be downstream of the water meter and upstream of the connection to the house. If you tie into a rear yard hose bib, be aware that the water pressure will be lower because the water for your house is regulated by a separate pressure regulator.
- ❑ Lay an extra pipe sleeve or two under any new hardscape elements just in case you need to add pipes or wires in the future. Be sure to cover the ends of the pipe with duct tape before covering and mark the location on your landscape plan.

- ❑ If you are using drip irrigation, note that often drip emitters are not installed until after planting is complete. When installing the emitters, be sure to place them at least 6 inches away from the stem of the plant to prevent rot.
- ❑ Consult your local irrigation supply store or some of the major irrigation manufacturers for more detailed installation guides.

Planting Installation:

With the irrigation in place, you can get started on the plant installation. Review the following tips to help you through the plant placement and installation process.

- ❑ Use a garden hose to outline groundcover areas to help you visualize the design before you start installation.
- ❑ Set the plants, while still in their containers, in their approximate location per your planting design plan, stand back and review. Make any adjustments to the design at this time to avoid having to dig up and relocate any plants. Many drought tolerant landscapes look sparse for the first few years but will fill in over time. Be sure to allow proper spacing to allow each plant to grow to its full size.
- ❑ Dig plant holes twice the width of the plant root ball, and just deep enough to bury the roots. Water the hole before placing the plant. When planted, the top of the root ball should be even with or slightly above soil level.
- ❑ Once in the hole, the plant should be packed firmly into place with original soil from the hole. Extra soil can be used to create a berm around the plant to hold water.
- ❑ Cover the planting area with a 2 or 3 inch deep layer of mulch. Keep a few inches clear of mulch around the plant stems to prevent rot. Mulch has many benefits. It can help suppress weeds, enrich the soils, protect plant roots from compaction, provide a finished look to your garden, and conserve water!
- ❑ Monitor your garden to ensure it receives adequate water. Even natives and drought tolerant plants need water to get established. To minimize watering needs during establishment, install your landscape in the fall before the rains.

6

Care For Your WaterSmart Landscape

Whether you install a new WaterSmart landscape or are just looking for tips on how to conserve water in your existing landscape, the following section can help you make an immediate impact on your landscape water savings.

- ❑ **Plan ahead.** Keep a copy of the irrigation plan, legend, and runtime schedule to make it easy to buy replacement parts or find pipes to make repairs or adjustments if needed in the future.
- ❑ **Monitor and minimize watering.** When set up correctly, your smart controller will automatically adjust watering times to respond to changes in weather. To maximize water savings, you should program your controller to apply only the amount of water needed for each zone. A good rule of thumb is to water only when the top inch of soil is dry. If you see runoff before the end of the irrigation cycle, adjust the schedule to run several times with a shorter duration each time. This will allow water to infiltrate the soil between cycles. Use the following tool to determine the optimal watering schedule for your property:

City of San Diego Landscape Watering Calculator
<http://apps.sandiego.gov/landcalc/>



Rotator nozzles throw streams of water with larger water droplets which helps to prevent misting and runoff, but each nozzle still needs to be checked periodically to ensure it is running correctly.

- ❑ **Water at appropriate times.** Consult your local water agency to determine the hours you are allowed to water. If possible, schedule your irrigation system to run in the early morning. It is best to avoid watering at night as some plants develop fungus and mildew problems from night time watering. Avoid watering mid-day to eliminate excessive evaporation.
- ❑ **Check irrigation equipment.** Because irrigation is typically run in the early morning, you may not witness the system running. Be sure to manually turn the system on seasonally and after severe weather changes to check for potential problems. Check drip systems to ensure emitters are working and clean out filters as needed. Over time, drip emitter locations may need to be shifted to the outer edge of the plant root balls as your plants grow. Adjust spray sprinklers to prevent overspray and runoff onto roads, sidewalks, driveways and patios and repair any problems.





- ❑ **Fertilize smart.** Use an organic fertilizer or compost. This can be store-bought or made from products from around the home. Compost can be made from garden waste and some kitchen waste to continually enrich your soil. For more information and recipes for do-it-yourself compost, see the Water Authority’s [eGuide to a WaterSmart Lifestyle](#).
- ❑ **Weed smart.** Weed naturally whenever possible. The common use of herbicides can be costly and is very damaging to the environment. Designing and maintaining a healthy landscape can be the best defense against weeds. To stop the spread of weeds, hand pull any weeds that come up in your garden every few weeks. Be sure to pull them before they go to seed. You may also want to monitor and remove weeds from nearby landscapes to prevent weed seeds from blowing onto your property.

- ❑ **Manage pests.** The key to controlling pests and diseases is to maintain healthy soil. Good watering practices integrate pest management such as hitting pests with a blast of water, releasing beneficial bugs (ladybugs and lacewings), spraying insecticidal soap, and using compost tea. See the [eGuide](#) for more information on natural pest control and compost tea.
- ❑ **Mulch.** Maintain a 2 to 3 inch layer of mulch. Replace the mulch as needed.
- ❑ **Make a clean sweep.** Use a broom or blower instead of a hose to clean driveways and sidewalks.
- ❑ **Make a plant maintenance checklist.** Keep a copy of your plant list and make a checklist of maintenance requirements for each plant.



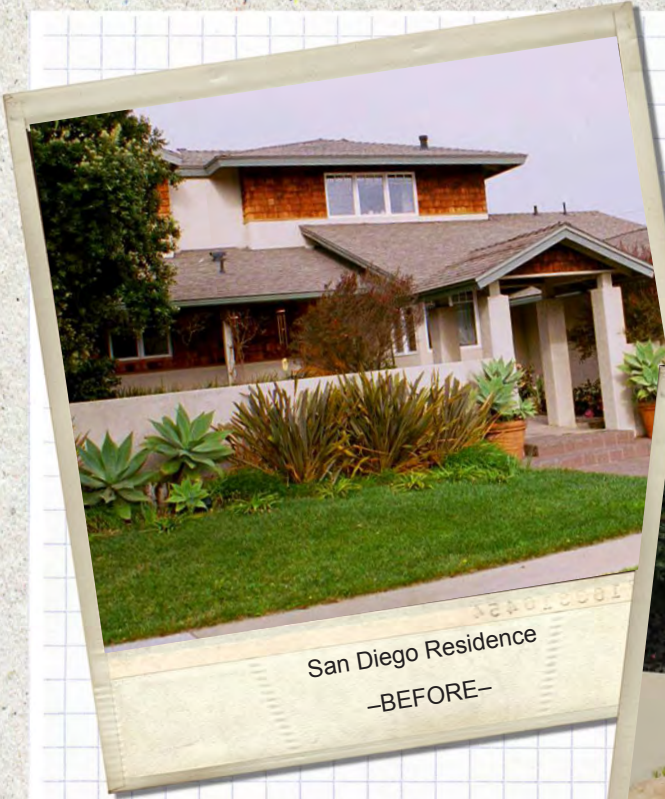
Maintain a 2 to 3 inch layer of mulch.



Create a maintenance calendar.

- ❑ **Find incentives.** Take advantage of financial incentives offered by the San Diego County Water Authority and local water agencies.
- ❑ **Monitor.** Monitor monthly costs and water use on an ongoing basis.
- ❑ **Celebrate!** Enjoy the peace of mind that comes from knowing you did your part to protect our natural resources and the environment.
- ❑ **Learn more.** Visit WaterSmartSD.org.

Case Study - Finished WaterSmart Garden



San Diego Residence
-BEFORE-



San Diego Residence
-AFTER-





Review of the steps to a **WaterSmart Landscape**

Your WaterSmart landscape is a key part of our region's water efficiency goals. By converting your yard to a WaterSmart landscape, you not only have the potential to beautify your property, save money, and reduce maintenance, but you also help protect, and even improve, the health of our natural environment. Below is a summary of the key steps involved in completing a WaterSmart landscape renovation:

- Step 1 Identify your landscape target.** Identify your target plant and irrigation types in the beginning to guide you through the design.
- Step 2 Create a basic plot plan.** Making a plan of your existing landscape will help you visualize your future landscape.
- Step 3 Evaluate your site.** Evaluate site elements such as soil, drainage, sun exposure, and views to identify opportunities and constraints that will help you make design decisions as you start the design process.
- Step 4 Design your WaterSmart landscape.** Even if you don't plan to install the whole project at one time, lay out the master plan for your landscape so you can verify that the final product will be unified. Include a WaterSmart planting and irrigation design. Verify your planned water use before you start construction, and adjust if it doesn't meet your original landscape target.
- Step 5 Implement your plan.** When implementing your plan, take your time. Hire a professional if needed -- get it right the first time.
- Step 6 Care for your WaterSmart landscape.** Learn the best practices for maintaining your landscape and consider creating a maintenance schedule to help you keep on track. You can even use these maintenance techniques to help you save money in existing landscape areas that have not been upgraded.



Appendix A

Water Use Calculations

The following worksheet is based on the requirements shown on the California Department of Water Resources Water Use Calculation Worksheet. The complete worksheet in digital format can be downloaded at: www.water.ca.gov/wateruseefficiency/landscapeordinance – Water Budget Calculator link. You can also refer to the City of San Diego Landscape Watering Calculator at <http://apps.sandiego.gov/landcalc/>.

Project Name	
ETo (per "Definitions", next page)	
Total Area (s.f.) (Including SLA)	

Maximum Applied Water Allowance (MAWA)

Landscape Area (LA) (s.f.)	Special Landscape Area (SLA) (s.f.)	MAWA $(E_{To}) \times (0.62) \times [(0.7 \times LA) + (0.3 \times SLA)]$ (gallons)

Estimated Total Water Use (ETWU)

Hydrozone #	Plant Factor (PF)	Irrigation Efficiency (IE)	Hydrozone Area (HA) (s.f.)	ETWU $(E_{To}) \times (0.62) \times [(PF \times HA / IE) + SLA]$ (gallons)
SLA	1			
TOTAL				

MAWA		gallons
ETWU		gallons
% Savings $(100 - ETWU / MAWA \times 100)$		% (must be 0 or greater)

Ensure that ETWU is less than or equal to MAWA.

Water Use Calculation Worksheet Definitions

ET_o = reference evapotranspiration, as indicated below (inches per year)

ETWU = estimated total water use (gallons per year)

HA = hydrozone area (square feet)

IE = irrigation efficiency, as indicated below

LA = landscaped area, includes special landscape area (square feet)

MAWA = maximum applied water allowance (gallons per year)

PF = plant factor, as indicated below

SLA = special landscape area (square feet). An area of the landscape dedicated to edible plants, an area recycled with irrigated water, or an area dedicated to turf within a park or golf course where turf provides a passive or active recreational surface.

Irrigation Type	Irrigation Efficiency (per Irrigation Association BMPs 2005)	Irrigation Efficiency (per City of San Diego Land Development Code)	Irrigation Efficiency (assumed worst case for use with these guidelines)
Drip	0.80	0.80 - 0.90	0.80
Micro Spray	0.80	0.70	0.70
Bubblers	-	0.85	0.80
Stream Rotators	-	0.70	0.70
Rotors	0.70	0.70	0.70
Traditional Spray	0.55	0.60	0.55

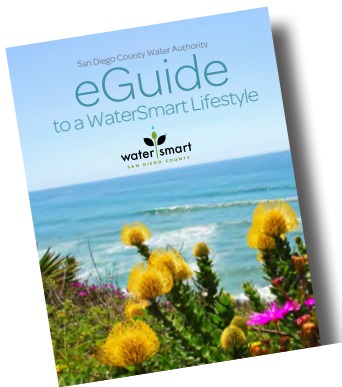
Plant Water Use Type	Plant Factor (per WUCOLS Rating as recommended by California state ordinance)	Plant Factor (average for use with these guidelines)
Very Low	>0.1	0.1
Low	0.1-0.3	0.2
Medium	0.4-0.6	0.5
High	0.7-0.9	0.8
SLA	1.0	1.0

Region	ET_o
Chula Vista	44.2
Escondido	54.2
Miramar	47.1
Oceanside	42.9
Otay Lake	50.4
Pine Valley	54.8
Ramona	51.6
San Diego	46.5
Santee	51.1
Torrey Pines	39.8
Warner Springs	56.0

Appendix B

WaterSmart Programs, Incentives and Resources

WaterSmartSD.org is your online source for water-use efficiency programs, incentives, tools and more. Use our interactive locator tool to find information specific to your local water agency.



eGuide to a WaterSmart Lifestyle

The digital magazine, “eGuide to a WaterSmart Lifestyle,” is your go-to resource for water-efficient living in San Diego County. Visit the eGuide at WaterSmartSD.org/residential-guide for

- Inspirational plant and garden photos
- Landscape ideas
- Helpful videos
- Plant finders
- Design tools
- Garden calculators
- Links to certified landscape professionals
- And much more ...

WaterSmart Gardens

There’s nothing like experiencing the beauty, texture and scents of WaterSmart gardens in person. Several neighborhood nurseries and regional gardens across San Diego County are dedicated to showcasing climate appropriate plants and landscapes. Take advantage of tours, classes and one-on-one design consultations offered by these resources. Great places to start are:

- The Water Conservation Garden at Cuyamaca College TheGarden.org
- San Diego Botanic Garden SDBGarden.org

Property Assessed Clean Energy Program

PACE program financing allows property owners to fund qualified water-efficiency projects with little or no up-front costs. Properties located within participating cities or unincorporated areas of San Diego County may be able to finance up to 100 percent of their project and pay it back over time through their property tax bill. For more information visit your city’s website. If you live in an unincorporated area, visit the county’s website at sandiegocounty.gov.

Appendix C

Definitions

Bubblers. Bubblers are emission devices that flow from one point source and can have a full or a multi stream pattern. For typical landscape projects a low flow model should be selected; this will help water infiltrate the soil and prevent runoff.

Conventional spray irrigation. Conventional spray irrigation is one of the least efficient types of irrigation. It is a type of fixed overhead spray with a fan shaped pattern of water and a spray range of 4 to 20 feet.

Compost. Compost is used when planting to condition the soil. It is a deep, rich brown and should have a pleasant, earthy smell. Mix up to 30% into backfill soil when planting. Use about half that amount when planting very low water use succulents or native plants in disturbed, urban soil. If soil is untouched, no amendment is recommended for natives.

Drip emitters. Drip emitters are one of the most efficient ways to deliver water to your garden. They convey water through low flow emission devices to each plant. The most efficient systems incorporate pressure compensating devices, and all drip systems should be installed with a filter.

Filters. Filters are used with drip systems to remove organic and inorganic debris from water that could potentially clog the emission devices.

Gear rotors. Rotors are classified as moderately efficient, high-flow overhead irrigation. Multiple rotating streams distribute water evenly, but rotors typically have a spray range of 25 feet and larger, so are best suited to large areas.

Hydrozone. Grouping of plants with similar water use. Very low, low, moderate, and high water use hydrozones should be irrigated separately according to water need, using only one type of sprinkler or emitter.

Impact rotors. Impact rotors are one of the least efficient methods of automatic irrigation which throw rotating streams of water and have the distinct sound when it throws bursts of water across the landscape. Impact rotors are quickly being replaced by gear rotors and other types of irrigation which are quieter. They have a spray range of 20 to 40 feet.

In-line emitters. In-line drip emitters are one of the most efficient ways to deliver water to your garden. They convey water through drip tubing with low flow emitters which are installed at regular intervals along the tubing. The drip tubing can be installed at grade or just beneath the surface. The most efficient systems incorporate pressure compensating devices, and all drip systems should be installed with a filter.

Micro-spray. Micro spray is a type of low flow spray irrigation. It has a spray range of up to 6 feet, so is best suited to small areas.

Mulch. Mulch is used to cover the soil surface after planting. Shredded mulch provides food for beneficial soil microorganisms which feed plants, improve pest resistance, and create healthy, living soil. Use shredded mulch to provide the best environment for your plants and for you. Mulch reduces weeds, evaporation and runoff, and allows the soil to retain moisture. Shredded mulch will stay on hillsides and resist high winds. Always leave several inches of un-mulched area around the crown of the plant. As a rule of thumb, 1 cubic yard of mulch will cover 100 square feet 3" thick.

Pressure compensating devices. These devices regulate pressure either at the valve or at the emitter and maintain a constant flow regardless of incoming pressure.

Rotator nozzles. Rotator nozzles are the most water efficient type of overhead spray for areas 8 to 30 feet in width. Rotator nozzles throw water with multiple rotating streams similar to gear rotors, but the advantage is that the nozzles are small enough to fit on conventional spray bodies. Compared to conventional spray nozzles, rotator nozzles throw larger water droplets at a slower rate which helps to prevent misting and runoff.

Smart controller. A smart controller has a timer or clock and is either weather-based or has a moisture detection system that automatically adjusts watering times in response to environmental changes. Smart controllers have the ability to turn off your sprinklers when it rains and increase the frequency and duration of watering in hotter weather.

Appendix D

Soil Test Instructions

Soil is essential to a healthy landscape and efficient water use. Get to know your soil and how to care for it and you will be rewarded with easier maintenance, a healthier environment, and a more beautiful landscape. Here are some simple tests to help you evaluate your soil:

Drainage Test

Here's a simple way to evaluate your soil drainage.



1. DIG A HOLE

Dig a hole 12 inches wide x 12 inches deep, putting the soil to the side to be used for the Squeeze Test and the Worm Test.



2. FILL WITH WATER

Fill the hole with water and let it drain overnight.



3. FILL WITH WATER AGAIN

Use a stick to span the hole from the top of the stick to the bottom of the pit. Measure the distance again in one hour.

Evaluate your results based on drainage rate.

- Drainage less than 1" per hour.** Drainage is considered poor. This may be due to high clay content or soil compaction. Add compost to the soil before planting to improve soil aggregation and water infiltration. Select plants that can tolerate poor drainage or consider using raised beds or mounds. Irrigation should be scheduled for short cycles and long soak periods to meet plant water demand and avoid runoff.
- Drainage is between 1" and 3" per hour.** Your drainage is considered acceptable.
- Drainage is greater than 3" per hour.** Water moves too quickly through your soil. Add compost before planting to hold the water in the root zone longer and select plants tolerant of fast drainage. Regular surface applications of shredded mulch may be helpful for long term management. Irrigation scheduling may require longer watering times to ensure plants have enough available water at the root zone.

Squeeze Test

The squeeze test can help you determine the texture of your soil. Start by taking a handful of moistened (but not wet) soil and squeeze it firmly. Open your hand and determine which of the following it most resembles:

- ❑ **High sand content soil.** Ball of soil falls apart when you open your hand.



Sand is quick draining but has a limited ability to retain nutrients and moisture. Sandy soils often benefit from the addition of organic matter.

- ❑ **Loamy soil.** Ball of soil holds its shape, but crumbles when you poke it lightly.



Loam is generally considered to be ideal soil because it retains moisture and nutrients but doesn't stay soggy.

- ❑ **High clay content soil.** Holds its shape and does not crumble when you poke it lightly.



Clay is typically nutrient rich, but has poor drainage. Drainage can sometimes be improved by deep cultivation which breaks up the hard layer of soil.

Worm Test

A worm test provides insight into the health of your soil biology and is as simple as counting the number of worms in your soil. Sift through the soil from your drainage test hole. If you can't find at least ten earthworms, your soil is low on organics and will benefit from the addition of compost when planting. Use shredded mulch after planting to continue to feed the beneficial organisms. Worms help reduce soil compaction, allowing water and air to move into the soil to provide healthy growing conditions and maximize efficient water usage.

pH Level Test

Buy a pH test kit, fill the tube or container with soil, and follow the instructions to measure the acidity of your soil on a scale of zero (very acidic) to fourteen (very alkaline). Most plants need a pH of five to eight to absorb the nutrients in the soil.

A pH kit can range from approximately \$8-\$60 at a nursery or garden supply store.

Appendix E

WaterSmart Plant Lists

The following five plant themes are an inspirational guide of plants appropriate to our region. Refer to the WUCOLS (Water Use Characteristics of Landscape Species) rating system as a resource to identify water use for other plants that are not included in these sample plant lists.

http://ucanr.edu/sites/WUCOLS/Plant_Search/



WaterSmart Asian Effect:

Type	Scientific Name	Common Name	Mature Size HT x WIDTH	WUCOLS			Design Feature
				3	4	6	
				Coastal	Inland	Desert	
Tree	<i>Agonis flexuosa</i>	Peppermint Tree	25-40' x 15-25'	L	M	/	EV
	<i>Albizia julibrissin</i>	Silk Tree	30' x 30'	M	M	M	FL
	<i>Cercis canadensis</i> 'Forest Pansy'	Eastern Redbud	20' x 25'	M	M	/	FL
	<i>x Chitalpa tashkentensis</i>	Chitalpa	20-25' x 20-25'	L	L	M	FL
	<i>Gleditsia triacanthos</i> 'Moraine'	Thornless Honeylocast	40' x 40-45'	M	L	L	FA
	<i>Koelreuteria paniculata</i>	Golden Rain Tree	20-30' x 25-35'	L	L	M	FL
	<i>Lagerstroemia indica</i>	Crape Myrtle	15-20' x 15'	M	M	M	FL
	<i>Prunus ilicifolia</i>	Holly Leaf Cherry	15-25' x 10-15'	VL	VL	/	EV
	<i>Vitex agnus-castus</i>	Chaste Tree	12-16' x 10-15'	L	M	M	FL
	<i>Zelkova serrata</i>	Saw Leaf Zelkova	50' x 50'	L	M	M	FA
	Large Shrub	<i>Dodonaea v.</i> 'Purpurea'	Purple Hopseed Bush	12' x 6-8'	L	M	M
<i>Elaeagnus pungens</i> 'Fruitlandii'		Silverberry	12-15' x 15-18'	L	L	L	FL
<i>Hibiscus syriacus</i>		Rose of Sharon	8-12' x 6-10'	M	M	M	FL
<i>Pittosporum t.</i> 'Silver Sheen'		Silver Sheen Kohuhu	12-16' x 6-8'	M	M	/	EV
<i>Nandina domestica</i>		Heavenly Bamboo	6-8' x 3'	L	M	M	FA
Medium Shrub	<i>Grevillea r.</i> 'Scarlet Sprite'	Scarlet Sprite Grevillea	4-5' x 6-8'	L	L	M	FL
	<i>Juniperus sabina</i>	Savin Juniper	4-6' x 5-10'	L	M	M	EV
	<i>Myrsine africana</i>	African Boxwood	6-8' x 4-5'	L	M	/	EV
	<i>Raphiolepis indica</i> 'Clara'	Clara Indian Hawthorn	4-5' x 4-5'	M	M	M	FL
	<i>Symphoricarpos albus</i>	Snowberry	4-5' x 4-5'	L	L	/	FR



WaterSmart Asian Effect:

Type	Scientific Name	Common Name	Mature Size HT x WIDTH	WUCOLS			Design Feature
				3	4	6	
				Coastal	Inland	Desert	
Small Shrub	Berberis t. 'Crimson Pigmy'	Dwarf Japanese Barberry	2' x 3'	L	L	M	AC
	Grevillea 'Cherry Royal'	Cherry Royal Grevillea	2-3' x 3-4'	L	L	M	FL
	Jasminum floridum	Showy Jasmine	3-4' x 4-5'	M	M	M	FL
	Myrtus communis 'Compacta'	Dwarf Myrtle	2-3' x 2-3'	L	M	M	EV
	Nandina domestica 'Gulf Stream'	Heavenly Bamboo	3' x 3'	L	M	M	FA
	Pittosporum t. 'Wheeler's Dwarf'	Dwarf Mock Orange	3-4' x 4-5'	M	M	M	EV
Vine	Clematis lasiantha	Pipestem Clematis	20-30' tall	VL	L	/	FL
	Lonicera j. 'Halliana'	Hall's Honeysuckle	15' tall	L	L	M	FL :(
	Wisteria sinensis	Chinese Wisteria	25' tall	M	M	M	FL
GC	Convolvulus mauritanicus	Ground Morning Glory	1' x 1 1/2-3'	L	L	M	FL
	Cotoneaster d. 'Coral Beauty'	Bearberry Cotoneaster	1' x 6-8'	M	M	M	EV
	Juniperus conferta 'Blue Pacific'	Shore Juniper	1' x 6-8'	L	M	M	EV
	Juniperus horizontalis 'Wiltonii'	Creeping Juniper	6" x 6-8'	L	M	M	EV
	Juniperus s. 'Tamariscifolia'	Tamarix Juniper	18-30" x 10'	L	M	M	EV
	Ophiopogon japonicus	Mondo Grass	12-15" x 12-15"	M	M	M	GRS

Design Feature Key
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WaterSmart Landscape MAKEOVER SERIES

WaterSmart Contemporary Effect:

Type	Scientific Name	Common Name	Mature Size HT x WIDTH	WUCOLS			Design Feature
				3	4	6	
				Coastal	Inland	Desert	
Tree	<i>Agonis flexuosa</i> 'After Dark'	Peppermint Willow	15-25' x 10-15'	L	L	L	AC
	<i>Cercidium</i> x 'Desert Museum'	Desert Museum Palo Verde	25' x 25'	VL	L	L	FL
	<i>Chorisia speciosa</i>	Floss Silk Tree	40-60' x 20-40'	L	L	M	AC
	<i>Dracaena draco</i>	Dragon Tree	15-25' x 15-25'	VL	L	/	AC
	X <i>Chitalpa tashkentensis</i>	Chitalpa	20-30' x 20-30'	L	L	M	FL
Large Shrub	<i>Agave a. v. attenuata</i>	Agave	4-5' x 6-8'	L	L	L	AC
	<i>Agave weberi</i>	Weber Agave	5' x 6-10'	L	L	L	AC
	<i>Arctostaphylos</i> 'H. McMann'	Manzanita	6-10' x 6-12'	L	L	/	EV
	<i>Caesalpinia gilliesii</i>	Desert Bird of Paradise	10' x 8'	L	L	M	FL
	<i>Euphorbia tirucalli</i>	Sticks on Fire	4-8' x 3-5'	VL	/	L	AC
	<i>Hesperaloe funifera</i>	Giant Hesperaloe	6' x 6'	VL	L	L	AC
	<i>Leonotis leonurus</i>	Lion's Tail	4-8' x 4-6'	L	L	M	FL
Medium Shrub	<i>Artemisia ludoviciana</i>	Prairie Sagebrush	3' x 6'	L	L	L	AC
	<i>Dasyliirion texanum</i>	Green Desert Spoon	5' x 5'	L	L	L	AC
	<i>Eremophila m. brevifolia</i>	Spotted Emu Bush	2-4' x 2-4'	L	L	L	FL
	<i>Helictotrichon sempervirens</i>	Blue Oat Grass	1-2' x 1-2'	M	M	M	GRS
	<i>Hesperaloe parviflora</i>	Red Yucca	3-4' x 2-4'	VL	L	L	AC
	<i>Leucophyllum</i> f. 'Compacta'	Compact Texas Ranger	5' x 5'	L	L	L	FL
	<i>Leymus c.</i> 'Canyon Prince'	Wild Rye	2-3' x 2-3'	M	M	?	GRS
	<i>Nolina macrocarpa</i>	Bear Grass	3' x 4'	VL	VL	L	AC
	<i>Phormium</i> 'Evening Glow'	New Zealand Flax	3' x 4-6'	M	M	M	AC
	<i>Salvia gregii</i>	Autumn Sage	2-4' x 2-3'	L	L	M	FL



WaterSmart Contemporary Effect:

Type	Scientific Name	Common Name	Mature Size HT x WIDTH	WUCOLS			Design Feature
				3	4	6	
				Coastal	Inland	Desert	
Small Shrub	Aloe x 'Blue Elf'	Coral Aloe	18" x 2'	L	L	L	FL
	Bulbine frutescens	Stalked Bulbine	12" x 18"	L	L	L	FL
	Hesperaloe p. 'Perpa'	Breaklights Red Yucca	2' x 2'	VL	L	L	FL
	Kalanchoe thyrsiflora	Paddle Plant	12-18" x 12-18"	L	L	M	AC
	Sisyrinchium bellum	Blue-eyed Grass	12-18" x 12-18"	L	L	M	GRS
	Yucca rupicola	Twisted Leaf Yucca	2' x 2-3'	L	L	L	AC
Vine	Passiflora caerulea	Blue Passion Vine	10-15' tall	M	M	M	FL
	Distictis buccinatoria	Blood Red Trumpet Vine	30' tall	M	M	M	FL
GC	Dalea greggii	Trailing Indigo Bush	2' x 6-8'	L	L	L	AC
	Dymondia margaretae	Dymondia	2-3" x 20"	L	L	/	EV
	Echeveria imbricata	Blue Rose Echeveria	12" x 12"	L	L	M	AC
	Festuca glauca	Blue Fescue	12" x 12"	M	M	M	GRS
	Othonna capensis	Little Pickles	2" x 1'	L	?	?	AC
	Sedum reflexum 'Blue Spruce'	Blue Spruce Stonecrop	3" x 10"	L	L	L	AC
	Sedum spathulifolium	Stonecrop	2-4" x 24"	L	L	L	AC
	Sempervivum 'Black'	Black Hens and Chicks	4-6" x 12"	L	L	L	AC

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WaterSmart Mediterranean Effect:

Type	Scientific Name	Common Name	Mature Size HT x WIDTH	WUCOLS			Design Feature
				3	4	6	
				Coastal	Inland	Desert	
Tree	Arbutus 'Marina'	Marina Strawberry Tree	20-30' x 20-30'	L	L	M	FR
	Brahea armata	Blue Hesper Palm	25-40' x 6-8'	L	L	L	AC
	Chamaerops humilis	Mediterranean Fan Palm	8-12' x 10-15'	M	M	M	AC
	Cupressus sempervirens	Italian Cypress	40-60' x 8-12'	L	L	M	AC
	Laurus nobilis	Sweet Bay	20-30' x 10-20'	L	L	M	EV
	Olea europaea 'Swan Hill'	Swan Hill European Olive	15-25' x 15-20'	L	L	M	EV
	Pinus halepensis	Aleppo Pine	50-60' x 60-80'	L	L	L	EV
Large Shrub	Agave attenuata	Foxtail Agave	2-5' x 3-5'	L	L	L	AC
	Carpenteria californica	Bush Anemone	6-8' x 4-5'	L	M	/	FL
	Cistus ladanifer	Crimson-spot Rockrose	4-5' x 4-5'	L	L	L	FL
	Raphiolepis indica	Indian Hawthorn	4-5' x 4-5'	L	M	M	FDN
	Feijoa sellowiana	Pineapple Guava	12-20' x 10-15'	L	L	M	FL
	Westringia 'Wynyabbie Gem'	Coast Rosemary	6-8' x 4-6'	L	L	M	FDN
Medium Shrub	Cistus x purpureus	Purple Rockrose	4' x 4-6'	L	L	L	FL
	Correa 'Ivory Bells'	Australian Fuchsia	4-5' x 4-5'	L	L	M	FL
	Rosmarinus o. 'Blue Spires'	Blue Spires Rosemary	4-5' x 2-3'	L	L	M	FDN
	Salvia leucantha	Mexican Sage	3-4' x 4-6'	L	L	M	FL



WaterSmart Mediterranean Effect:

Type	Scientific Name	Common Name	Mature Size HT x WIDTH	WUCOLS			Design Feature
				3	4	6	
				Coastal	Inland	Desert	
Small Shrub	<i>Agave parryi</i>	Artichoke Agave	2-4' x 2-4'	L	L	L	AC
	<i>Aloe striata</i>	Coral Aloe	1-2' x 2-3'	L	L	L	AC
	<i>Convolvulus cneorum</i>	Bush Morning Glory	2-4' x 2-4'	L	L	L	FL
	<i>Correa 'Dusky Bells'</i>	Australian Fuchsia	1-2' x 2-3'	L	L	M	FL
	<i>Lavandula a. 'Munstead'</i>	English Lavender	1-2' x 1-2'	L	L	M	FL
	<i>Myrtus communis 'Compacta'</i>	Dwarf Myrtle	2-3' x 2-3'	L	M	M	FDN
	<i>Salvia greggii 'Furman's Red'</i>	Autumn Sage	2-4' x 2-3'	L	L	M	FL
Vine	<i>Bougainvillea</i> var.	Bougainvillea	20-30' tall	L	L	M	FL
	<i>Distictis buccinatoria</i>	Blood-red Trumpet Vine	20-30' tall	M	M	M	FL
	<i>Pyrostegia venusta</i>	Flame Vine	20-30' tall	M	M	M	FL
GC	<i>Cistus 'Sunset'</i>	Magenta Rockrose	1-2' X 6-8'	L	L	L	FL
	<i>Juniperus c. 'Blue Pacific'</i>	Shore Juniper	1' x 6-8'	L	L	M	EV
	<i>Myroporum p. 'Pink'</i>	Pink Myoporum	1' x 4-5'	L	L	M	EV
	<i>Rosmarinus o. 'Prostratus'</i>	Trailing Rosemary	1' x 5'	L	L	M	EV
	<i>Sedum reflexum</i>	Sedum	6-10" x 24"	L	L	L	AC
	<i>Senecio mandraliscae</i>	Blue Chalksticks	1-2' x 2-3'	L	M	M	AC
	<i>Thymus serpyllum</i>	Creeping Thyme	1-2" x 12-15"	M	M	M	FL

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WaterSmart Landscape
MAKEOVER SERIES

WaterSmart Native Garden Effect:

Type	Scientific Name	Common Name	Mature Size HT x WIDTH	WUCOLS			Design Feature
				3	4	6	
				Coastal	Inland	Desert	
Tree	<i>Cercidium</i> x 'Desert Museum'	Desert Museum Palo Verde	25' x 25'	VL	L	L	AC
	<i>Cercis occidentalis</i>	Western Redbud	12-20' x 10-15'	L	L	/	FL
	<i>Chilopsis linearis</i>	Desert Willow	30' x 25'	VL	L	M	FL
	<i>Myrica californica</i>	Pacific Wax Myrtle	20-30' x 10-20'	L	M	/	FL
	<i>Pinus torreyana</i>	Torrey Pine	40-60' X 30-50'	L	M	/	EV
	<i>Quercus agrifolia</i>	Coast Live Oak	40-60' x 40-50'	L	L	M	EV
Large Shrub	<i>Calliandra californica</i>	Baja Fairy Duster	6' x 6'	VL	L	L	FL
	<i>Ceanothus 'Concha'</i>	California Lilac var.	6-8' x 6-12'	VL	L	/	FL
	<i>Heteromeles arbutifolia</i>	Toyon	15-20'x15-20'	VL	L	/	EV
	<i>Rhus integrifolia</i>	Lemonade Berry	6-10' x 10-15'	VL	L	/	EV
	<i>Ribes speciosum</i>	Flowering Gooseberry	4-8' x 4-6'	L	M	/	FL
	<i>Rosa californica</i>	California Rose	5' x 5'	L	L	/	FL
Medium Shrub	<i>Arctostaphylos</i> d. 'Sunset'	Sunset Manzanita	3-4' x 3-4'	L	L	/	EV
	<i>Encelia californica</i>	Coast Sunflower	3-4' x 3-4'	VL	L	L	FL
	<i>Galvezia speciosa</i>	Island Snapdragon	3-4' x 4'-5'	VL	L	M	FL
	<i>Muhlenbergia rigens</i>	Deer Grass	4-5' x 4-6'	L	M	M	GRS
	<i>Salvia alpiana</i>	White Sage	4-5' x 4-5'	VL	VL	L	EV
	<i>Salvia clevelandii</i>	Cleveland Sage	4-5' x 4-5'	VL	VL	L	FL
	<i>Yucca whipplei</i>	Our Lord's Candle	2-3' x 3-4'	L	L	L	AC
Small Shrub	<i>Agave desertii</i>	Desert Agave	1-2' x 2-3'	L	L	L	AC
	<i>Agave shawii</i>	Shaw's Agave	2-3' x 3-4'	L	L	L	AC
	<i>Dudleya brittonii</i>	Chalk Liveforever	1- X 1-2'	VL	L	/	AC
	<i>Eriogonum g. rubescens</i>	Buckwheat	1-2' x 2-3'	VL	L	L	FL



WaterSmart Native Garden Effect:

Type	Scientific Name	Common Name	Mature Size HT x WIDTH	WUCOLS			Design Feature
				3	4	6	
				Coastal	Inland	Desert	
Vine	<i>Clematis pauciflora</i>	Clematis	12' tall	VL	L	?	FL
	<i>Lonicera subspicata</i>	Chaparral Honeysuckle	3-8' tall	L	VL	?	FL
	<i>Vitis californica</i>	California Wild Grape	30' tall	VL	L	M	FR
GC	<i>Achillea millefolium</i>	Yarrow	1-2' x 2-3'	L	L	M	FL
	<i>Arctostaphylos</i> e. 'Carmel Sur'	Carmel Sur Manzanita	1' x 10'	L	L	/	EV
	<i>Arctostaphylos</i> 'Pacific Mist'	Pacific Mist Manzanita	2-3' x 6-12'	L	L	/	EV
	<i>Baccharis</i> p. 'Pigeon Point'	Dwarf Coyote Bush	2' x 8'	L	L	/	EV
	<i>Ceanothus</i> g. <i>horizontalis</i>	California Lilac var.	1-2' x 10-015'	VL	L	/	FL
	<i>Ceanothus</i> 'Joyce Coulter'	California Lilac var.	2-3' x 10-15'	VL	L	/	FL
	<i>Fragaria chiloensis</i>	Sand Strawberry	6"-12" x 2'	M	M	M	EV
	<i>Mahonia repens</i>	Creeping Mahonia	18-24" x 3-4'	L	M	/	EV

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WaterSmart Tropical Effect:

Type	Scientific Name	Common Name	Mature Size HT x WIDTH	WUCOLS			Design Feature
				3	4	6	
				Coastal	Inland	Desert	
Tree	<i>Bauhinia x blakeana</i>	Hong Kong Orchid Tree	20' x 20'	M	M	M	FL
	<i>Brahea armata</i>	Blue Hesper Palm	25-40' x 6'-8'	L	L	L	AC
	<i>Erythrina crista-galli</i>	Cockspur Coral Tree	15-20' x 15-20'	L	L	M	FL
	<i>Cassia splendida 'Golden'</i>	Golden Wonder Senna	15-18' x 15'	L	L	L	FL
	<i>Phoenix dactylifera</i>	Date Palm	80-100' x 20'	L	L	M	AC
	<i>Strelitzia nicolai</i>	Giant Bird of Paradise	30' x 5-7'	M	M	M	AC
Large Shrub	<i>Alyogyne huegelii 'Monle'</i>	Blue Hibiscus	6' x 4'	L	L	L	FL
	<i>Anigozanthos 'Big Red'</i>	Big Red Kangaroo Paw	4-6' x 2-3'	L	L	M	AC
	<i>Aucuba japonica</i>	Aucuba	4-6' x 4-5'	M	M	M	EV
	<i>Cistus x purpureus</i>	Purple Rockrose	4-6' x 4-6'	L	M	M	AC
	<i>Lantana camara 'American Red'</i>	American Red Lantana	4-6' x 4-6'	L	L	M	FL
	<i>Phormium tenax</i>	New Zealand Flax	3-8' x 3-8'	L	M	M	AC
	<i>Teucrium fruiticans 'Asureum'</i>	Azure Bush Germander	4-6' x 4-6'	L	L	M	FL
Medium Shrub	<i>Acanthus mollis</i>	Bear's Breech	4' x 4'	M	M	M	AC
	<i>Anigozanthos 'Bush Gold'</i>	Bush Gold Kangaroo Paw	2-3' x 1-2'	L	L	M	AC
	<i>Bougainvillea 'Singapore White'</i>	Bougainvillea	3-4' x 3-4'	L	L	M	FL
	<i>Callistemon c. 'Little John'</i>	Dwarf Bottlebrush	3' x 5'	L	L	M	FL
	<i>Convolvulus cneorum</i>	Bush Morning Glory	2-4' x 2-4'	L	L	L	FL
	<i>Coreopsis gigantea</i>	Giant Coreopsis	3-5' x 3-5'	VL	L	/	FL
	<i>Strelitzia reginae</i>	Bird of Paradise	3-5' x 3-5'	M	M	M	AC



WaterSmart Tropical Effect:

Type	Scientific Name	Common Name	Mature Size HT x WIDTH	WUCOLS			Design Feature
				3	4	6	
				Coastal	Inland	Desert	
Small Shrub	<i>Aeonium canariense</i>	Giant Velvet Rose	1-2' x 2-3'	L	L	L	AC
	<i>Anigozanthos viridis</i> 'Phar Lap'	Green Kangaroo Paw	1-2' x 1-2'	L	L	M	AC
	<i>Clivia miniata</i>	Kaffir Lily	1-2' x 1-2'	L	M	M	FL
	<i>Coreopsis auriculata</i> 'Nana'	Dwarf Coreopsis	6-8" x 2'	L	L	M	FL
	<i>Euphorbia rigida</i>	Silver Spurge	1-2' x 2-3'	VL	L	L	AC
Vine	<i>Bougainvillea spectabilis</i>	Bougainvillea	20-30' tall	L	L	M	FL
	<i>Macfadyena unguis-cati</i>	Cat's Claw Vine	20-30' tall	L	L	L	FL
	<i>Passiflora j.</i> 'Coral Seas'	Coral Seas Passion Flower	15-20' tall	M	M	M	FL
	<i>Pyrostegia venusta</i>	Flame Vine	20-30' tall	M	M	M	FL
GC	<i>Crassula capitata</i> 'Campfire'	Campfire Crassula	6" x 2-3'	L	L	L	AC
	<i>Fragaria chiloensis</i>	Sand Strawberry	8-12" x 3-6'	M	M	M	EV
	<i>Lantana montevidensis</i>	Trailing Lantana	8-12" x 3-6'	L	L	M	FL
	<i>Sedum s.</i> 'Cape Blanco'	Cape Blanco Stonecrop	2-4" x 24"	L	L	L	AC
	<i>Sedum makinoi</i> 'Limelight'	Japanese Stonecrop	2-4" x 8-12"	L	L	L	AC

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