



MOJAVE RIVER WATERSHED GROUP

Campus Garden Guide



I'M A
stormwater
TROOPER



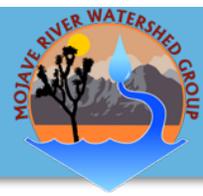


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Getting Started

Who is the Mojave River Watershed Group (MRWG)?

MRWG is an organization committed to protecting the Mojave River, its watershed, plants and wildlife, and the quality of our High Desert water against stormwater pollution. Stormwater pollution happens when rain and snowmelt flows over land or impervious surfaces (paved streets, parking lots, and building rooftops) and does not seep into the ground. As the runoff flows it collects debris, chemicals, sediment or other pollutants that could adversely affect water quality if the runoff is discharged untreated.

It is important to teach our younger generations how to protect water, our most precious resource, and how they can take part in caring for the community where they live. Each year, we conduct Stormwater Trooper assemblies for thousands of students in Oak Hills, Phelan, Victorville, Hesperia and Apple Valley. We also participate in High Desert Science, Technology, Engineering and Math (STEM) events each year.

This guide will help teach children how water is a key resource that should be protected by showing them how to build and take care of a stormwater savvy garden. We hope you find our Campus Garden Guide helpful!

Enjoy!

Why Garden?

In California, especially the High Desert, water will always be a precious resource that must be well managed, protected and used responsibly. Currently, one of the greatest threats to our water supply is stormwater pollution. As educators, it is important to teach the next generation to value water and protect it from pollution. This water wise garden guide helps schools build and maintain a garden. It includes tips for preventing stormwater pollution and water conservation. Efficient gardens do not require heavy use of fertilizers or pesticides, which are a major source of stormwater pollution to our waterways and a threat to public health. The guide offers gardening tips so you can grow your garden naturally with native plants that require less water and pesticides. It provides information for irrigation and soil management to ensure your garden doesn't produce excessive runoff and presents some fun ideas for how to go beyond the garden and share your success with your community.

The time to start a garden is now – and we're here to help!

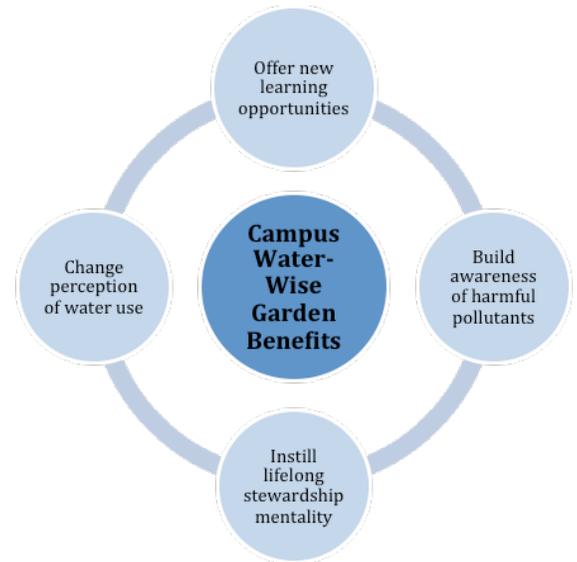
The Benefits of Having a School Garden

- Teaches children the importance of water conservation and pollution prevention
- Promotes responsibility and teamwork
- Changes eating habits
- Improves test scores
- Changes attitudes about learning
- Promotes physical activity



Getting Started - Who is your Garden Leader?

Before you begin working on your garden, you will need to choose an advisor who will lead the project. You'll also need to decide which students will work in the garden. Will the garden be worked on by one class or multiple classes? What kind of support from staff will you need? How much time can be dedicated to this project? These are questions that you must answer before you begin.



Getting Started - How do I Get Additional Support?

After you have decided who will lead the school garden project, it is time to enlist some help! Get the school involved by asking for volunteers. Volunteers can be parents or other students and teachers. Think about partnering with a local nursery to provide further guidance and tips. Local nurseries are listed in the resource section of this guide. Consider looking at donations and funding from local gardening groups or larger national foundations.

Plan Ahead! Prepare the soil by tilling and composting at least one month before getting started. Involve the students and adult volunteers in this process. It will be important for them to see the project through from start to finish.

What You Need



Safety First! Some gardening tools have sharp edges and claws that can be very dangerous if not handled properly. Do not allow children to use any tool that can cause an injury. Before use of any tool, take the time to teach children how to use them responsibly and safely. Always have at least one adult in the garden to supervise!





Pick The Perfect Plot

Deciding where to plant your garden is the first step to a thriving and stormwater savvy water wise or veggie garden! Before you choose your garden plot, there are multiple factors to consider. Study the items below before making your choice – and get the students involved! Discussing soil types, sun exposure and climate turn planting a garden into a great science lesson to learn about the High Desert environment.

Soil Type

High Desert soils contain mostly sand, silt and a small amount of clay. This means it does not have a lot of nutrients, and a saline and/or alkaline surface layer rests throughout the soil.

What does this mean? The answer is simple. Nutrients must be added in order for a garden to thrive. But be careful, soil that has too many nutrients isn't healthy. The best way to achieve a balance without affecting water quality is with organic compost. Read more about this method later in the fertilizer section.

You can also create living soil by introducing worms for composting, otherwise known as vermiculture, and kids of all ages will be engaged. Studying how worms digest and enrich soils for raised beds is a surefire way to engage students in learning about their garden.

Sun Exposure

All plants, flowers and veggies need the sun to grow, making exposure to the sun's rays a major factor in choosing where and what to plant in your garden. Some plants like partial shade, others thrive in full sun. Be sure to look closely at labels before purchasing plants or ask a garden expert at the nursery for help. To create a bountiful garden, you'll need to be aware of how the sun moves throughout the day and different times of the year. Make sure to note if there is a large tree or building that may shade parts of your garden for long periods of time.

Climate

Extreme heat, snow and howling winds – the High Desert has it all when it comes to weather. These temperature variances make weather an important consideration when planning your garden. Don't miss out on this opportunity to teach your students about local climate and why native plants have to adapt to survive harsh conditions. The good news? Native plants survive on little water, which is why they are ideal for water wise gardens!

If you're wondering when to plant, it is best to consult your local nursery who knows our area's climate and can give you expert guidance to ensure that your garden will thrive.





Preparing Your Soil

The most important part of your foundation is the soil. High Desert soil can be tricky to make sure that there are enough nutrients to support the plant life. Begin creating compost before you think about planting because wherever you decide to plant your garden, chances are, the soil will need a little help. Think about reaching out to local nurseries for their recommendations about what needs to be added to the soil.

You can also consider double digging. This is a technique used to prepare soil by digging to about the depth of a shovelhead and moving the dirt aside. Then, dig another shovelhead deep into the ground. After this is complete, you will add the first pile of dirt back into the ground mixed with the new stormwater savvy fertilizer or compost.

Did You Know?

Other organic fertilizers include seaweed extracts and fish!

Fertilizing

The first step you can take to ensure healthy water quality in the High Desert is to make sure fertilizers are used safely and correctly, or not at all. Nitrogen and phosphate from fertilizers can make their way into our watershed causing algae blooms that remove oxygen from waterways. These nutrients are also bad for our drinking water supply. Creating a stormwater savvy garden means that you are continually working to keep chemicals and litter out of your garden.

Here are some tips for stormwater safe fertilizer use when it is needed to get young plants to thrive:

1. Read the label and use only as directed.
2. Avoid applying near walkways, sidewalks, roadways and gutters.
3. Never apply 24 hours before rain.
4. Store in a covered area in sealed, waterproof containers.
5. Buy non-toxic, they work just as well.
6. If expired, or you no longer need fertilizer, dispose of it at a household hazardous waste collection facility.

Did You Know?

Coffee grounds can be used in compost! Be sure to collect all of the grounds from the teacher's lounge for your compost pile!

Compost

Composting is a natural way to fertilize and reduce waste. Nutrient rich compost is ideal for mixing into your garden's soil to promote healthy plant growth without using toxic chemical fertilizers. Lawn clippings, weeds, tree leaves, wood chips, livestock manure, straw and vegetable waste are all materials that can be composted. The composting process produces heat, so be sure to build your compost bin away from structures and check on it daily.



Here are some basic steps to begin your campus compost pile:

1. Stack compost material four to six feet high. Keep in place with wire, wood or rotating bin.
2. Turn or mix the compost pile every month to even the decomposing process.
3. Moisten the pile as needed to keep as wet as a squeezed out sponge.
4. Composting will be complete in six weeks to six months, depending upon heat and the size of the materials.
5. Place the composted material on the soil surface around plants, or mix into new planting areas and backfill soils.

Shaping your Soil

Want to take a more advanced step for your garden? If you're planning on maintaining your garden for more than one season, we suggest taking a step to shape the soil. It is important to get your garden right the first time to prevent spending additional time or money-wasting adjustments because of runoff issues.

Polluted runoff, caused by overwatering or rain events, can be captured and allowed to percolate back into the ground naturally. Shape your garden so excess water flows into a stormwater runoff conveyance system that provides an alternative to stormdrains, also called a bioswale. A bioswale will prevent excess water from running into streets or walkways where it picks up contaminants like oil, grease and brake dust from automobiles, and then flows untreated into stormdrains. The bioswale, and the plants within it, help filter contaminated water as it is absorbed into the ground and replenishes the groundwater basin.

Soil shaping is a great time to create pathways through your garden. There are many varieties of materials you can use for your walkway that can help prevent runoff pollution.



Three popular choices for shaping soil are gravel, wood mulch and decomposed granite. Of the three, decomposed granite is the wisest choice for a school yard because it eliminates the opportunity for tiny rocks or pieces of wood to be thrown.

Decomposed granite, commonly known as DG, is an ideal material for "hardscaping," or areas that are for walking or lounging such as pathways, entrances and patios. DG is compact, does not get muddy when wet and it is permeable, which means it allows water to soak back into the ground. DG is an affordable material that may be purchased from local landscape material suppliers. It may be used as mulching material around plants or trees to keep in moisture and prevent weeds. Unlike wood mulch, DG will not blow away in High Desert winds.



Planning and Design

Now that you have chosen a place for your garden and know how to prepare the soil, it's time to decide what you are going to plant. You can never go wrong with a good plan, especially when it comes to your garden design. The website www.bewaterwise.com offers a number of design options. In addition, a carefully designed garden can help you make smart water choices such as grouping plants that require similar amounts of water next to each other. This will be very helpful when we cover irrigation.

There are a number of ways to design! We encourage you to use at least one of the options below.

THEME DRIVEN DESIGN

Pick a theme by choosing a central component:

- Specimen tree theme (flowering trees)
- Dominant plant theme (Joshua trees)
- Compatible colors (flower)
- Recurring plant group theme
- Natural plant group theme



A flowering desert willow (specimen tree) serves as the focal point in this High Desert friendly, drought-tolerant landscape

FUNCTION DRIVEN DESIGN

The garden can also be planned by functional uses such as:

- Wildlife garden
- Edible/vegetable garden
- Cut flower garden
- Fragrant garden
- Shade garden

AREA DRIVEN DESIGN

Divide your garden into different areas:

- Sun areas - good for flowers, vegetables, fruit trees, dries out more quickly
- Shade areas - limits the types of plants to choose from, dries out slowly and stays wet longer
- Shading or hot spots - determine if deciduous trees (trees that lose their leaves each winter and allow the winter sun to penetrate) or evergreen trees fit better
- Hardscapes - lay out areas for planters and walkways
- Access - make moving around the garden or storage area easy

Tips for Placement - Whether you're planting trees or shrubs, here are some things to consider:

Trees

- Trees grow and deliver shade, which can be great. But, remember that certain plants have different sun and shade needs, so plant accordingly.
- Trees have deep roots and need infrequent, deep watering. Don't place trees in turf that needs water on a regular basis.
- Keep trees away from building foundations, sidewalks, walls and hardscape in general. Tree roots are famous for lifting and cracking hardscapes and clogging sewer lines. Choose tree locations first and with care.

Shrubs

Native plants, roses, flowering plants, hedges, perennials and annuals:

- Place the plant in the proper "exposure" (sun, shade, filtered sun)
- Place the plant in similar water-use groupings (low/drought, medium and high)
- Place plants in areas that are large enough for their full growth habits

Class Activities



Make markers for your garden out of wooden spoons and rocks! Allow the kids to paint the spoons and rocks to the corresponding plant. This is a quick and easy craft that will allow the kids to add their personal touch to the garden.

Planning Activity

We know planning your garden can seem a little daunting. Use this grid with the attached legend to plan your space. Make copies for the kids and ask them to draw their “perfect” garden.



Legend



Tree



Fruit



Water



Bush



Vegetable



Flower





Growing an Edible Garden

Edible Garden

Now that you have planned the foundation of your garden, you can begin to decide what edible plants your garden will include. Make sure to consider what fruits and vegetables the class would like to grow that are also High Desert friendly.

Want veggies? Then you'll need three elements - sun, wind and lean soil. By building a raised bed you can get the best of all of three. The resource section contains a brief guide from Sunset Magazine on how to build a raised bed – which is perfect for your school's maintenance team or wood shop class to construct. The best part is that raised beds are perfect for installing an efficient drip irrigation system.

Here are some of the best vegetable plants to grow in the High Desert:

- Lettuce
- Tomatoes – start growing indoors, and plant after last predicted frost date
- Carrots
- Sugar snap peas
- Beans
- Radish
- Summer squash
- Rhubarb
- Herbs: Chives, Basil, Thyme

For fruits, think twice before planting a citrus tree, as they tend to not do well in the cold High Desert winters. Instead, try these:

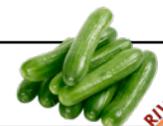
- Apple
- Plum
- Apricot
- Nectarine
- Peach
- Fig
- Pomegranate tree

After planting, it is highly advised to mulch the soil around the plants. Mulching is the process of applying materials such as compost, leaves or grass clippings to the soil surface to help reduce evaporation, restrict weed growth, regulate soil temperature, and prevent runoff. Be sure to secure mulch under rock landscaping or landscape netting to prevent the material from blowing away in High Desert winds.



COMPANION PLANTING

In natural ecosystems, plants perform functions that can either help or hurt plant growth. The same is true in our gardens. This chart will help you understand which plants grow well together and which to plant far apart.

Plant	Good companion	Bad Companions
Tomato 	Basil, onion, parsley, asparagus, marigold, nasturtium, carrot	Corn, potato, fennel, cabbage, dill, apricot 
Peppers 	Basil, carrot, onion	Beans, kale, cabbage
Squash	Nasturtium, corn, clover, dill 	Potato
Onion 	Beet, tomato, summer savory, chamomile	Beans, peas
Carrot 	Peas, chive, onion, leek, rosemary, sage, tomato, wormwood, parsley	Dill 
Corn	Potato, peas, bean, cucumber, pumpkin, squash, melon, marigold	Tomato
Plum	Chive, garlic, carrot, borage 	No bad companions
Apple	Chive, horsetail (equisetum), foxglove, wallflower, nasturtium, onions	Grass, potato 
Melon	Corn, sunflower, morning glory, okra 	Potato
Strawberry	Bean, spinach, borage, lettuce (Tip: Border with Thyme to deter worms)	Cabbage, broccoli, cauliflower 
Pomegranate	Potato, carrot, spinach, strawberry	Corn, sweet potato
Peach 	Tansy, garlic, basil, southernwood	No bad companions
Texas Ranger	Texas olive (Tip: doesn't require pruning or fertilizer)	No bad companions
Marigold 	Lettuce, potato, tomato, rose, bean 	No bad companions
Sunflower	Cucumber  (Tip: Sunflowers attract hummingbirds)	Potato
Lavender 	Aster, rosemary, any fruit tree (Tip: Plant around garden edges- Keeps slugs and pests out)	No bad companions
Jerusalem Sage	Rosemary, cabbage, carrot, corn	Cucumber 

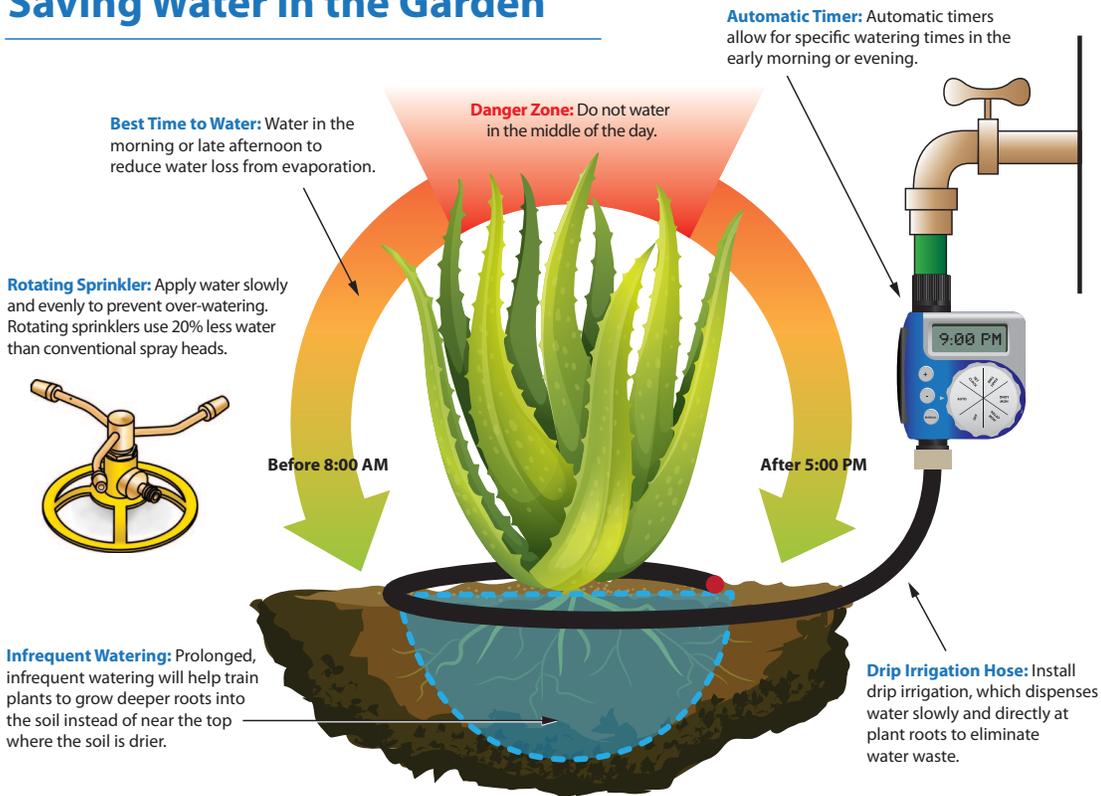
Wise Watering

When planning your garden's watering system, please check your city's watering mandate to make sure your garden can thrive with the permitted water amount. There are many techniques for managing water levels in your water wise garden.

One of the reasons the planning phase of designing your garden is so critical is because your irrigation system will need to be installed based off of where your plants are located. It is important to keep in mind the considerations highlighted in the *Planning and Design* section about placing plants with similar watering needs near each other.

How Often Should I Water?	
Summer Every 7 to 21 days	Fall Every 14 to 30 days
Spring Every 14 to 30 days	Winter Every 30 to 60 days

Saving Water in the Garden



Protecting Your Garden



To minimize the use of pesticides that pollute waterways, follow these easy tips:

1. Read product labels of pesticide or weed killing products and follow instructions on proper use, storage, and disposal of these toxic substances
2. Never apply 24 hours before rain
3. Spot apply rather than blanketing
4. Use nonchemical alternatives or less toxic pesticide products whenever possible

The University of California Statewide Integrated Pest Management (IPM) Program provides a wide breadth of resources for naturally remedying pest problems.

Here are some simple techniques:

1. Barriers and Traps: Collars, netting and coffee grounds can trap capture or impede pests.
2. Trap Plants: Strategically place plants that lure harmful insects away from plants you wish to protect. Once infested, the plant can be disposed. Examples of Trap Plants include, the Western Australian Pitcher Plant and the Venus Flytrap.



Use wooden fencing to surround your garden area.

3. Beneficial Insects: Introduce safe insects such as ladybugs, praying mantises and spiders into your garden to feed on harmful insects like aphids and cabbageworm. There are parasite remedies to some common pests, for example, caterpillar or aphid parasites. These insects inject parasites into the pests or pest eggs and kill them.



Use netting around the garden to prevent pests from entering.

4. Companion Planting: Place insect-repelling plants near ones you want to protect. These plants include basil, lavender and mint.
5. DIY Stormwater Pollution Safe Pesticide: Make your own safe pesticide with the recipe included on our Pinterest page. Please see the resources page for where to find us online.

WATCH YOUR CAMPUS GARDEN GROW

Choose one plant that interests you most. Sketch and label the plant and its parts, such as stem, leaves, flower, etc!

Name of Plant: _____

Sketching:

List two questions you have about this plant

1.

2.

Mojave Desert Map



Describe your garden's environment:

Does the air temperature feel warm or cool?

Is there a lot of sunlight?

Is the soil moist?

Gardener's Name:





Maintaining Your Garden

Once your beautiful garden is planted, you can begin to enjoy the fruits of your labor! Schedule days and times to tend the garden together. Make sure to allow for observation days with the kids to truly round out their experience in the garden.

Some ideas for ongoing care of your garden that will continue to reduce water use and prevent runoff pollution are:

- Pull weeds by hand instead of using harmful chemical weed killers
- Do not over-fertilize – doing so causes stormwater pollution and excessive growth, which requires more watering
- Water trees based on their seasonal water needs
- Refresh/replace mulch or decomposed granite to avoid erosion over time
- Check your irrigation system for clogged drip emitters or broken sprinklers – leaks waste water or can cause flooding to an area that will ruin low-water use plants
- Prune plants and pick up debris
- Harvest any vegetables or fruit so that nothing goes to waste

Find more tips in the Guide to High Desert landscaping included in the Resources section of this guide .

Create Your Maintenance Calendar Here!

Monday	Tuesday	Wednesday	Thursday	Friday



Plant Maintenance "Root-tine"

Name: _____

	Plant Name:	Plant Name:	Plant Name:
What do the seeds look like? (color, shape, size)			
What color are the leaves?			
How do the leaves feel?			
What shape are the leaves?			
How tall is the plant?			
How does it taste? (only if edible)			
What else do you notice about the plant?			





Beyond The Garden

The hard work of a garden is rewarded with fresh delicious produce, beautiful smelling flowers and amazing shade trees. Even better, all of the wonderful produce and plants that were grown in your garden are stormwater savvy and deliciously healthy. These are some ideas for celebrating all of your student's hard work:

1. Have a "farmer's market" with the produce grown in the kid's garden to put toward a special field trip or for new classroom and gardening equipment.
2. Have a harvest dinner with the class who grew the vegetables, using their produce in the meal. Make sure to invite the parents and volunteers.
3. Give back! Donate the produce to local food pantries.
4. Use any vegetable leftovers as compost in the garden to show the kids that nothing goes to waste!



Bonus! Check out the resources page for MRWG's Pinterest account where you will find a special board highlighting more gardening tips and advice for what to do once your garden is thriving!





Resources

We hope you have found this guide useful in your gardening journey. Below are the resources that will help you while navigating yourself through this process.

How-To Guide Resources:

- Kids Gardening/School Gardening: <http://www.kidsgardening.org/school-gardening>
- Western Growers Foundation: <http://www.csgn.org/>
- BeWaterWise.com offers a list of first steps to take when starting a California Friendly® garden: http://www.bewaterwise.com/first_step01.html
- Easy water wise gardening – SD and Sunset magazine collaboration: <http://www.sandiego.gov/water/pdf/waterwisegardening.pdf>
- American Society of Landscape Architects – bioswale or rain garden lesson plan for grades 6 -12: www.asla.org/uploadedFiles/CMS/Meetings_and_Events/National_Landscape_Architecture_Month/Resources/CD_Bioswale.pdf
- Master Gardeners of San Bernardino County: ucanr.edu/sites/sbmg/
- Online guide to native High Desert plants: www.fourdir.com/gardens.htm
- Arizona State University: <http://bit.ly/1SNucJe>
- Alliance for Water Awareness and Conservation's map of demonstration gardens for inspiration : <http://bit.ly/1iDHSsF>

Agency Partner Resources:

- A Guide to High Desert landscaping: <https://wrrc.arizona.edu/publications/water-harvesting/guide-high-desert-landscaping>
- Mojave Water Agency: <http://www.mojavewater.org>
- City of Victorville: <http://ci.victorville.ca.us/Site/CityServices.aspx?id=9728>
- City of Hesperia: <http://www.cityofhesperia.us>
- Town of Apple Valley: <http://www.applevalley.org>
- Apple Valley Ranchos Water Company: <http://www.avrwater.com/conservationDetail.php?recordID=23>
- Hesperia Water District: <http://www.cityofhesperia.us/index.aspx?NID=497>



Local Nursery Partners

- Cal Herbold's Nursery: 9403 E Ave, Hesperia, CA 92345
- Mark and Nellie's Nursery: 12875 Bear Valley Rd, Victorville, CA 92392 <http://www.highdesertnursery.com>
- Oak Hills Nursery: 13874 Ranchero Rd, Oak Hills, CA 92344 <http://www.oakhillsnursery.com>

Follow us on Social Media!

Check out our Tips and Tricks on Pinterest:
<https://www.pinterest.com/mojavewatershed/>

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Follow us on Twitter:
<https://twitter.com/MojaveRiver>

Mojave River Watershed Group Landscaping Partner List - Water Wise Garden Experts

- Lowe's
- Home Depot
- Cal Herbold's Nursery
- Lands Caper's Paradise Nursery
- OSH
- Oak Hills Nursery
- Mark and Nellie's Nursery

