
Oregon
Watershed
Approach
to
Landscape Design
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Landscape Designers

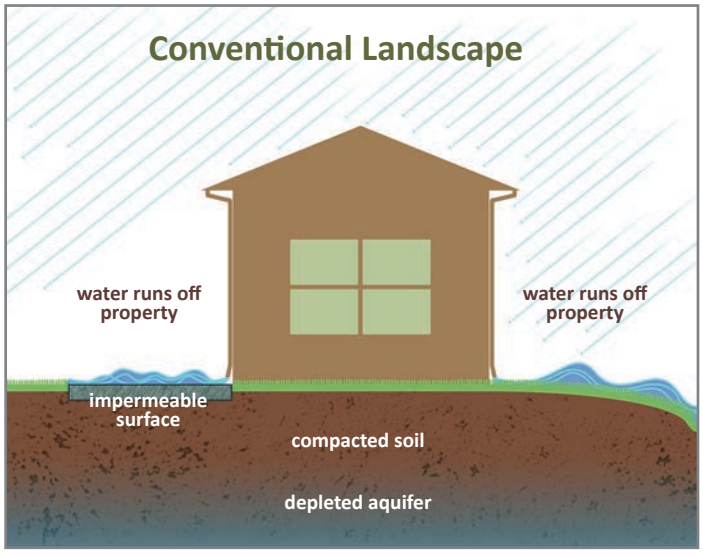
These **Beautiful** gardens...

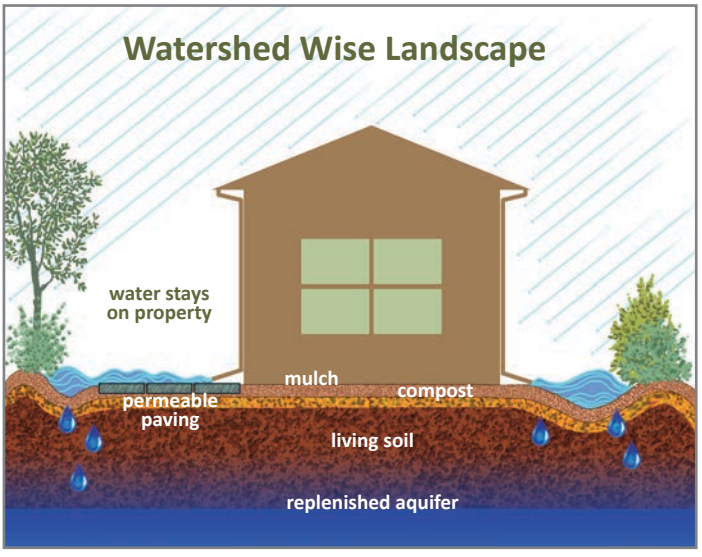
require less water, but don't look dry; they are attractive, lush and evergreen because they were created following the principles of the watershed approach to landscaping.

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

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

Now dig in!





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In three **Easy Steps**

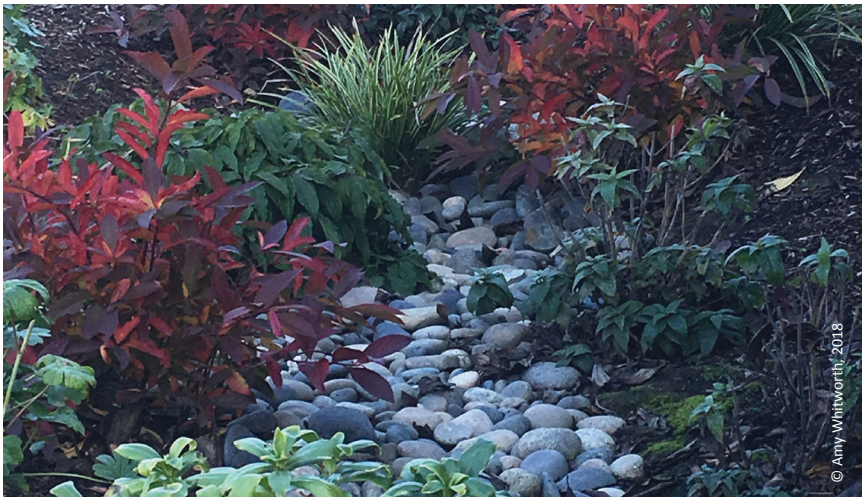
Healthy **Living Soil** captures **Rainwater**.

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

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

When downspouts are directed to these landscapes, living soil becomes a giant sponge that reduces flooding and helps keep plants healthy and happy, whether it's raining or dry times.

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



Selecting climate-appropriate plants like those from Mediterranean climates and, even better, from Oregon's own native plant communities, makes your garden automatically adapted to the seasonal summer dry spells, wet and cold winter months, and semi-arid or high desert inland climate. Many plants from the five Mediterranean climates, (South Africa, area around the Mediterranean Sea, Chile, Australia, and certain regions of California) are appropriate for our gardens.

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

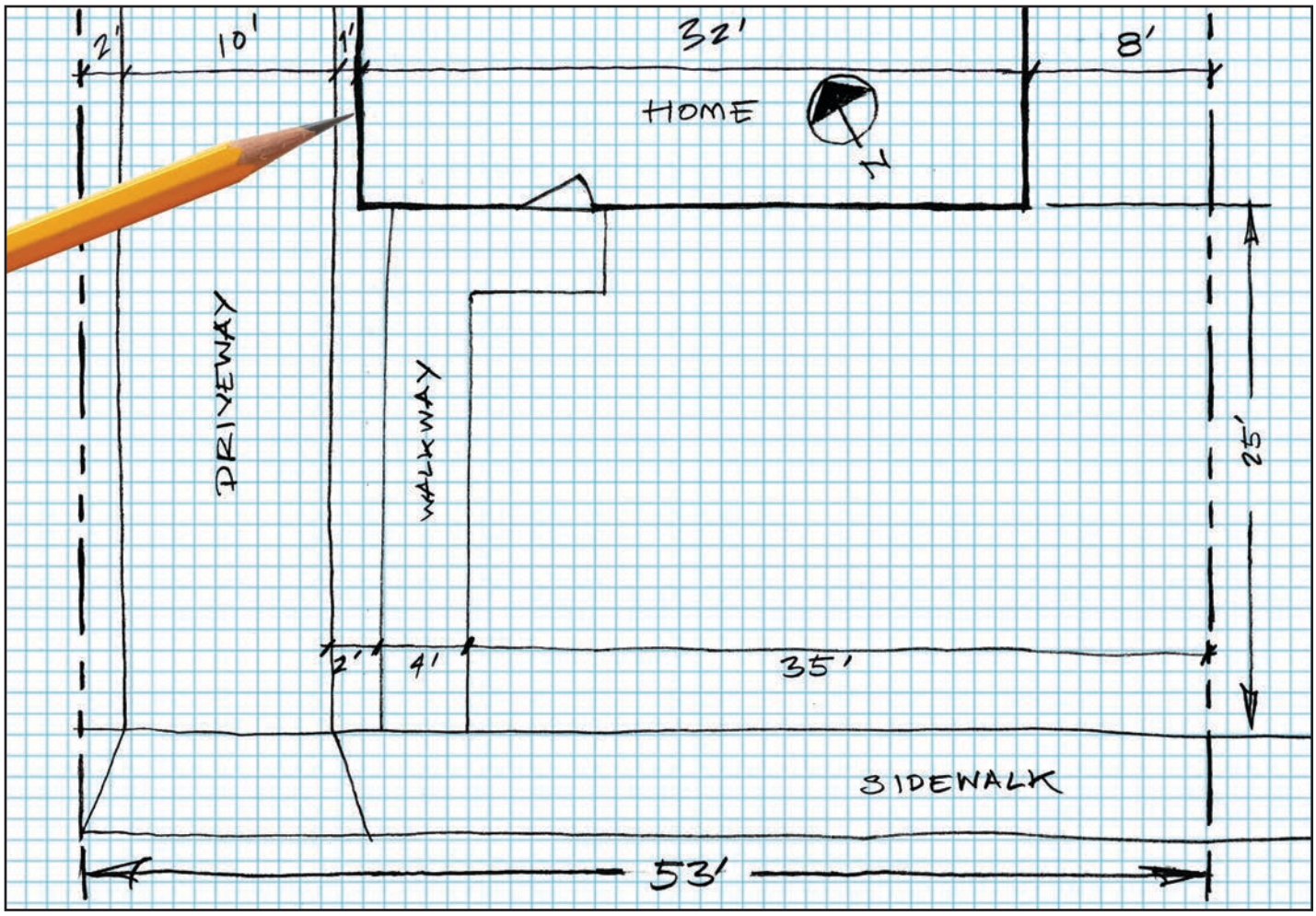
Efficient Irrigation supplements rain.

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

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

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

Start with a **Site Plan**



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Measure to Make Your Site Plan

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

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

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

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

Mind The Foundation

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

Need help finding dimensions? *maps.google.com*

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

Test your soil

Is your soil a **Brick** or a **Sponge**?

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

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

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

You Will Need:

Percolation Test

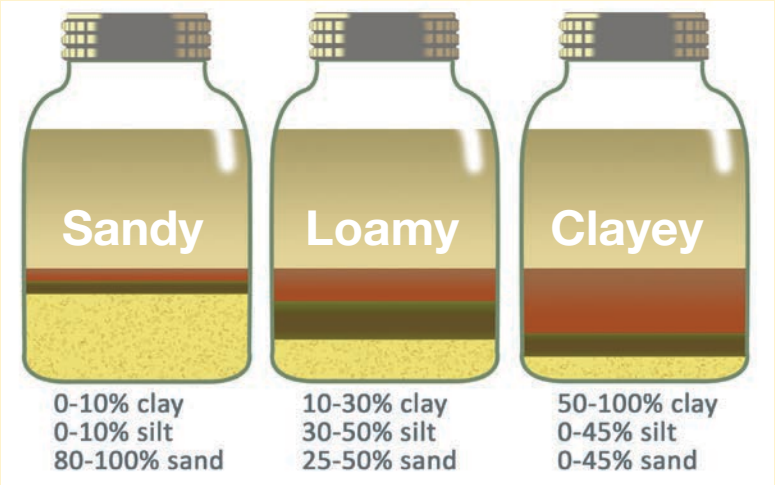
1. Dig a hole about 12" deep and 12" wide (that's a little larger than a 1 gal. plant container).
2. Fill the hole with water and wait. Note how long it takes to drain completely. This is necessary to completely saturate the soil.
3. Fill the hole all the way when all the water has drained out from first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

Results:

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

<1" per hour - You have a brick! Your soil needs some extra help so try sheet mulching to build the sponge.

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



Which jar does your sample most look like?

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

Loam best describes the jar with 40% Sand, 40% Silt, and 20% Clay. **Your soil is Loam.**

Determine Soil Type Using A Jar Test

(This is fun to do with kids!)

You Will Need:

1 Qt. size glass container with lid

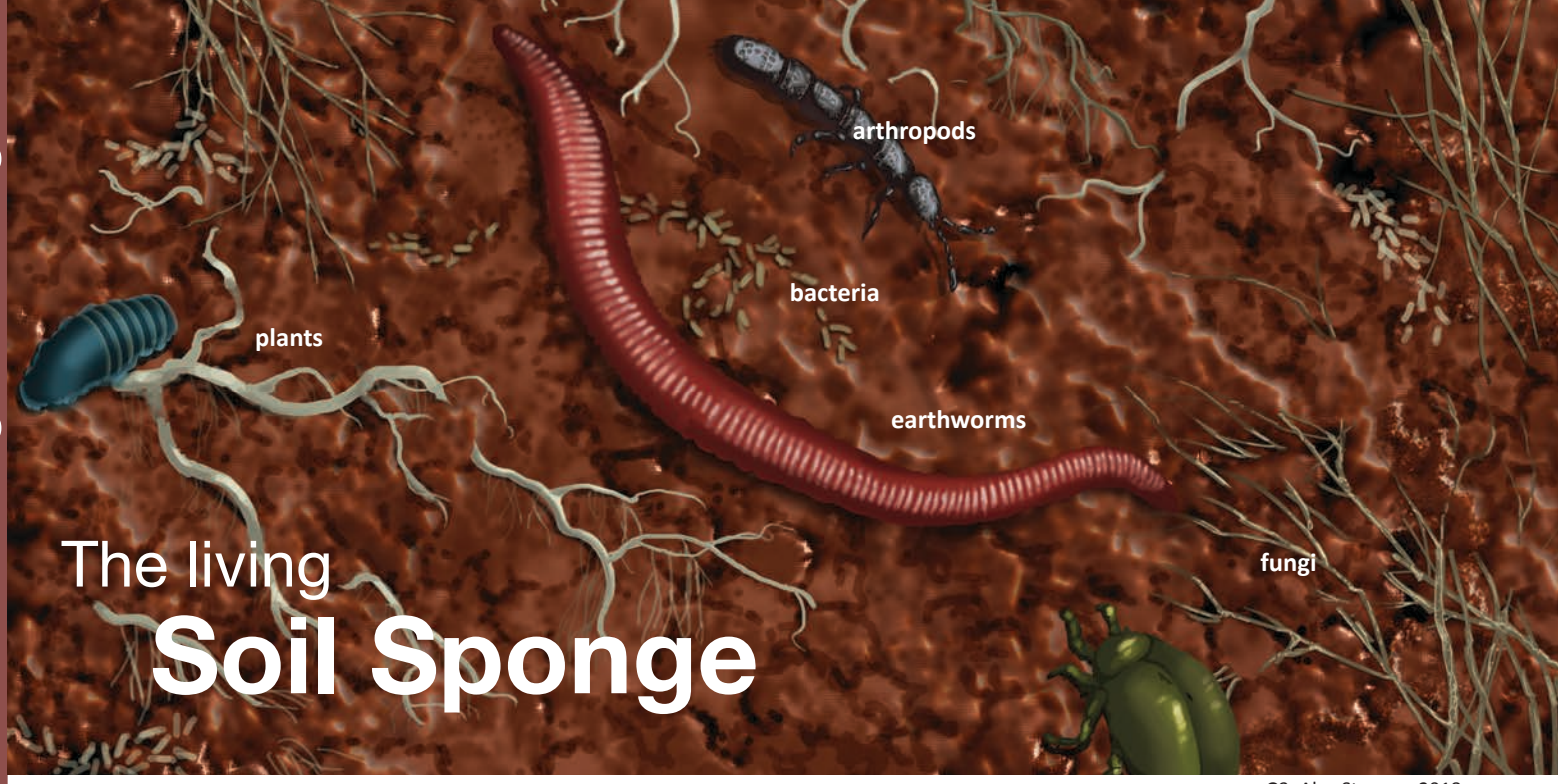
1 Cup of soil from the garden (Select one area per container, or take samples from several holes and blend them together.)

1 Teaspoon of alum (Find in baking section of grocery.)

3 Cups of distilled water

1. **Add soil and water together** in the glass container and shake until all solids are suspended in water.
2. **Place container on a shelf** and wait 24 hours.
3. **Wait another 24 hours**, if the container is still cloudy. After 48 hours, the layers should be settled: **Sand** on the bottom, **Silt** in the middle, and **Clay** on top.
4. **Measure the layers** in proportion to each other.
5. **Use the graphic** to determine the Soil Type based on the proportions of Sand, Silt or Clay.

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



The living Soil Sponge

© G3, Alex Stevens, 2018

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

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

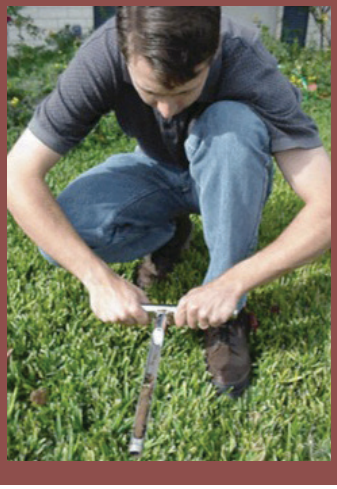
Oxygen is needed by healthy plant roots and soil organisms. Healthy soil has lots of little pockets filled with air. When soils are eroded, graded, or disturbed, their structure becomes compacted. Compaction is caused when the tiny air and water bubbles are squeezed out of the soil and the microbes are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

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

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

Life in the soil includes all the visible creatures, bacteria, protozoa, nematodes, and fungi, the food they eat, the excretions they make, and the root systems they sustain. Adding good quality compost into the soil is the fastest method of incorporating living microbes.

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



Use a Soil Probe

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

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

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

Purchase a soil probe online or at your local irrigation warehouse; or ask your designer to purchase one for you.

Grow a great soil **Sponge**

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

Eliminate **Compaction** by loosening soil.

If you can press a pitchfork into the soil, then that is all you need to do to create air holes.

If the soil is heavy clay, then augering or tilling may be necessary. Immediately after augering heavily compacted areas, fill the holes with good compost or earthworm castings. Then water the whole thing thoroughly to get the biological processes kickstarted. Remember that augering and tilling damage the biological network already existing in the soil, so they should be employed only when absolutely necessary. **If you have a lawn, aerating twice a year will help eliminate compaction.**

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

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

Water Wisely, first with rainwater.

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

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

Feed your soil.

Organic matter improves the water holding capacity of soil. You can get organic matter from a wide variety of sources, including compost and living mulch. Once you get things started, plants manufacture their own soil-building organic matter by dropping leaves, blossoms, and other debris.

Mulch, compost and compost tea can be applied to the surface of the soil and used as amendments during planting and soil preparation.

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

No Weed Cloth!


© Jodie Cook, 2018

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

Leaf It in Place

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

Go "No Blow"

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

Tea for Two

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

© Marilee Kuhlmann, 2018

Lose your lawn and **Build Healthy Soil**

Sheet Mulching makes **Soil Lasagna**.

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

You Will Need:

Shovels and Rakes
Bins for removed grass and soil
Landscape flags
Compost, Worm Castings, or Compost Tea
Wheelbarrow(s)
Mulch
Painters' Paper or big sheets or rolls of Recycled Cardboard
Hose with shut off nozzle at end
Water (LOTS!)

Secure Your Permits

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

Rent a Dumpster

For every 1,000 sq. ft. of turf removed you will need 1 low-boy (10 yard capacity) dumpster.

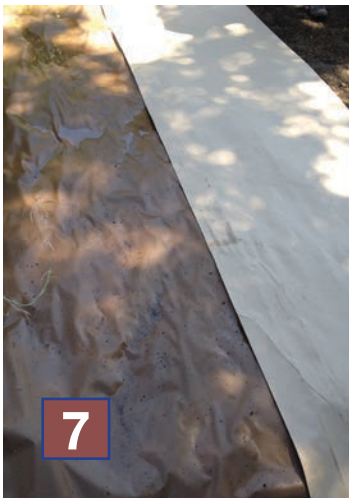
1 After you have checked for permits and any local water use restrictions, and called **UTILITY NOTIFICATION CENTER (8-1-1)** to mark underground utilities, deal with the lawn you have. If it's cool season, mow it to about 1/2" height, say goodbye and soak it thoroughly with water. Then go to #3. If you want to cut out cool season grass, go to #2.

2 If you have warm season grass, rent a sod cutter and remove the grass and 2"- 3" of roots beneath. The result is that you will be removing about 6" of grass and soil. Unfortunately, this must be hauled away, so you will need to rent a dumpster.

3 Dig a trench 8"-12" deep (about 1 shovel depth) and at least 12"-24" wide around all hard surfaces and 6" deep along building foundations. **Before moving on, complete your contouring for rainwater absorption and retention and any landscape alterations such as paths, patios, or other features**. Save any boulders you dig out to be reused in the rainwater retention areas.

4 Flag your sprinkler heads so you can find and adjust them later. Or, be prepared to abandon and replace the irrigation system.

5 Add a (1/2" to 1" deep) layer of compost on top of the graded soil. Alternatively, use humates, a sort of freeze-dried compost available at some landscape supply stores, or spray with compost or worm tea. You are adding good instant microbe food and some living microbes to the soil!



All photos this page © G3, Green Gardens Group, 2018

6 Water everything well. Wake up microbes! Let's get the soil party started!

7 Roll out painters' paper, cardboard or other paper. Overlap at the seams by at least 6". No naked soil!

8 On the hardscape edges, make a "burrito" of rolled paper and mulch to keep grass from resprouting immediately.

9 Water the paper again and add another layer of compost here, if you'd like. Rake a thick blanket 4"-6" deep of finely chopped, mixed leaf and wood mulch over the paper or compost.

10 Water the mulch thoroughly. This mulch layer will absorb more water than you ever thought possible to become soaked through. Don't despair; just keep slowly watering!

11 Plant right through the layers. The longer you wait to plant, the tastier the lasagna will be for the new plants, but you can plant right away if you removed the grass. **If you kept your cool season grass in place, count on waiting 3-4 months before planting. Make sure your HOA is ok with the time frame.**

12 Step back and admire your work! Have a glass of lemonade too; you earned it!

Keep adding **Compost** and **Mulch**

Compost is a soil amendment.

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

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

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

Mulch is a soil topping.

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

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

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

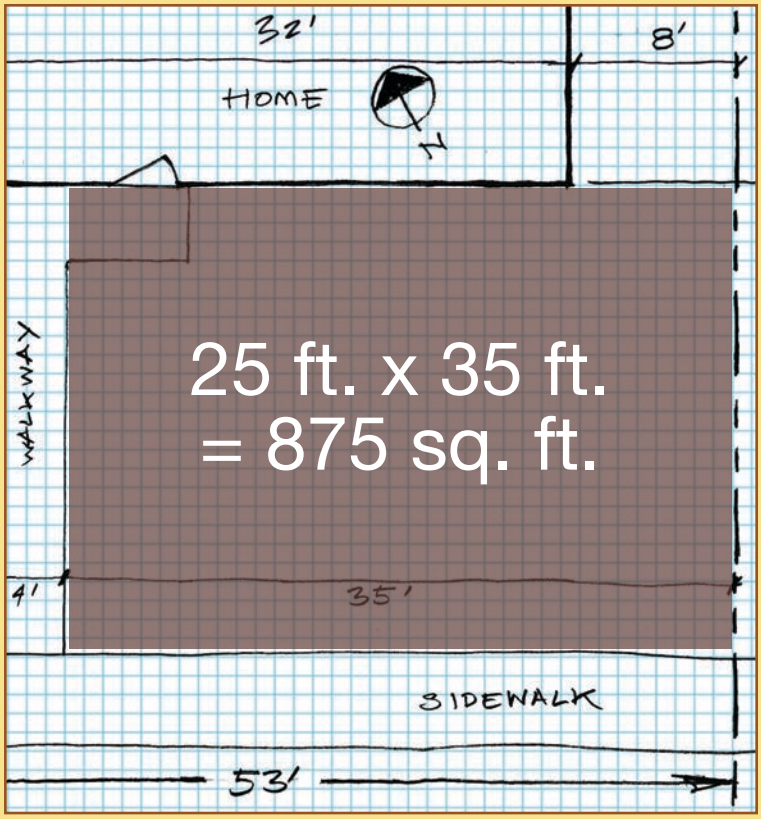
Need help buying amendment? *www.buy-compost.com*

MAKE IT
Less than 5 Cubic Feet

BUY IT IN BAGS
Between 5 and 25 Cubic Feet

BUY IT IN BULK
More than 25 Cubic Feet or 1 Cubic Yard

How **Mulch** does your garden **Need?**



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Add Organic Matter

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

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

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

Calculate the Material Requirement

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

SF x 1 inch ÷ 12" = Cubic Feet (CF) of material needed. (Dividing by 12" turns your inch of amendment into feet of amendment.)

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

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

CF ÷ 27 = Cubic Yards (CY).
So, 25 CF ÷ 27 = about 1 CY of material needed.

Applied to Our Site Front Yard:

875 SF x 1" ÷ 12" = 73 CF for each 1" of mulch.

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

We need 3" of mulch = 73 CF x 3" = 219 CF

For our front yard, that is 219 CF ÷ 27 = about 8 CY of mulch. That sounds like a lot of material! It looks like we will have to buy it in bulk (*see p. 40*).

Avoid These Mulches Around Plants!

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

"gorilla hair" shredded wood

dyed wood

dyed wood

gravel

rubber

Slow, Spread, Sink and Store

© Tom Rau, 2018

Five Great Permeable Hardscapes

1 Sand set pavers

2 Porous concrete paving

3 Interlocking pavers

4 Gravel

5 Cut 4”-6” gaps into brick path

photos 1,3,5: © Pamela Berstler, 2018

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

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

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

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

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

Contours capture rain

Plants OK With Wet Feet (Basin Swale Plants)

1 Anemopsis californica
Yerba Mansa

2 Juncus effusus
Soft Rush

3 Cornus sericea 'Kelseyi'
Kelsey's Dwarf Red-Osier Dogwood

Swale Plants Are Special. These basin plants like wet feet and can be completely submerged in rain water and still survive Oregon's hot dry summers without extra water. They're sort of plant Super Heroes that way! Look to the Scrub Shrub Wetland and Mixed Deciduous Forest plant communities for these selections.

Plants That Prefer Dry Feet (Berm Plants)

1 Epilobium californica 'Bowman'
Bowman's California Fuchsia

2 Calamagrostis foliosa
Leafy Reed Grass

3 Achillea millefolium
Common Yarrow

Berm Plants Like It Dry. On the mounded side berms, choose plants that like their feet drier. Throughout the entire landscape, make sure to mulch at least 2-4" deep around all the plants (though not right up against the trunks), including those in the bottom of the swale. Look to the Prairie plant community for these selections.

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Contour Your Garden In Six Easy Steps

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

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

Do not dig without calling UTILITY NOTIFICATION CENTER 8-1-1!

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

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

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

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

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

TAKE ACTION if your basin is slow draining!

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

© Paul Herzog, 2018

Contours for **Rain Capture**

Every garden can become a **Sponge.**

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

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

© Pamela Berstler, 2018

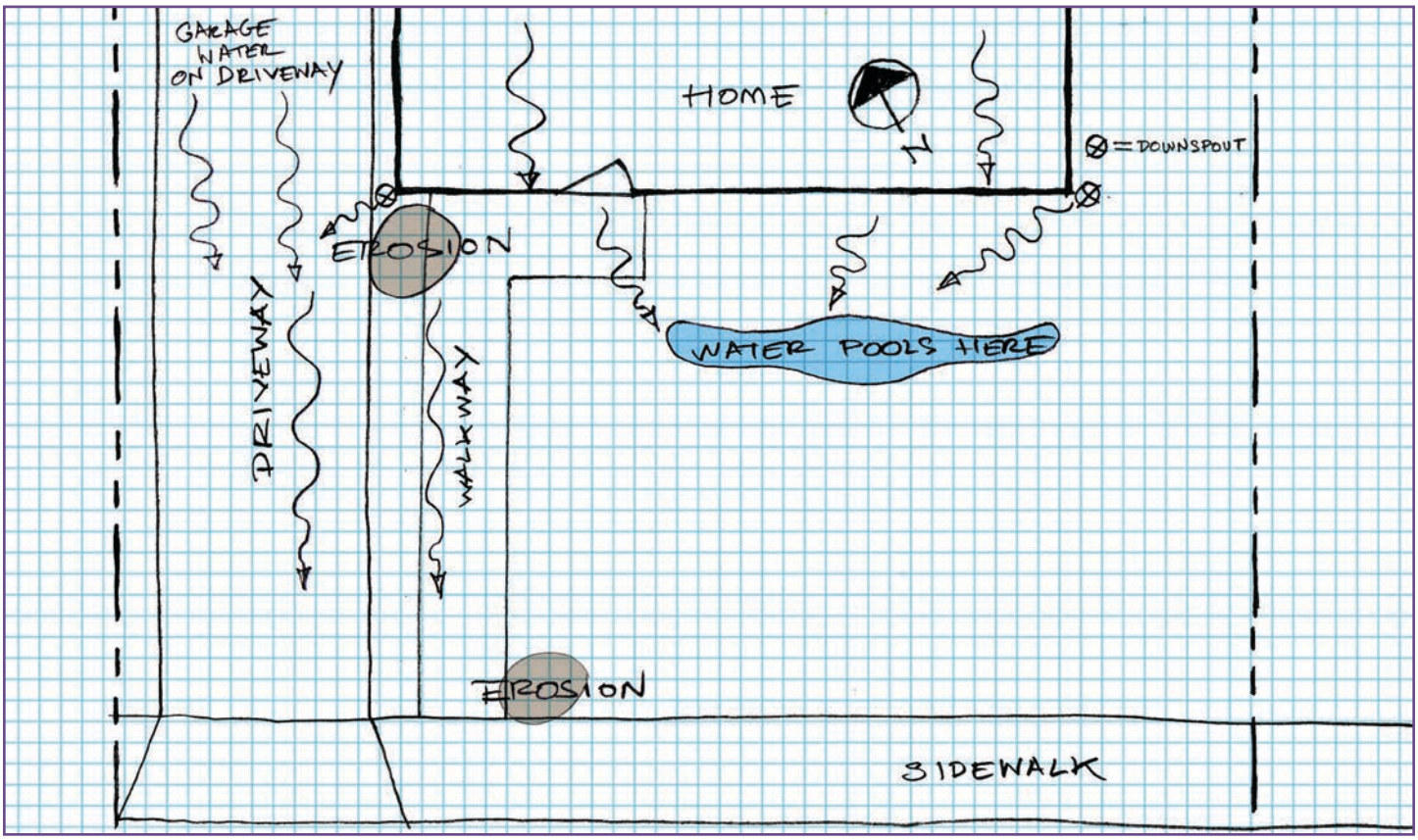
Basins and Swales are shallow depressions, or channels no more than 6"–24" deep, on gently sloped or nearly flat landscapes that move water around over short distances. The plants in and around the depressions capture and sink small volumes of surface water. Small, shallow depressions (6"- 12") are best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

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

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

© Paul Herzog, 2018

Imagine your yard is a **Mini-Watershed**



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

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

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

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

Once you know the total area of the roof, you can figure out the amount of rainfall that it generates.

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

© Amy Whitworth, 2018

Capture **First Flush**

First Flush is the **First Inch of Rain** after a dry spell.

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

Calculate How Much Water Comes Off Your Roof

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

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

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

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

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

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


© Tom Rau, 2018

How Much water per downspout?

First figure out how much water is coming from the whole roof, and then divide the roof into sections and calculate the particular amounts falling from each downspout:
Rainfall (in Inches) x Roof Area Square Feet x 0.62 = Gallons of Rain Water From Your Roof

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

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

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

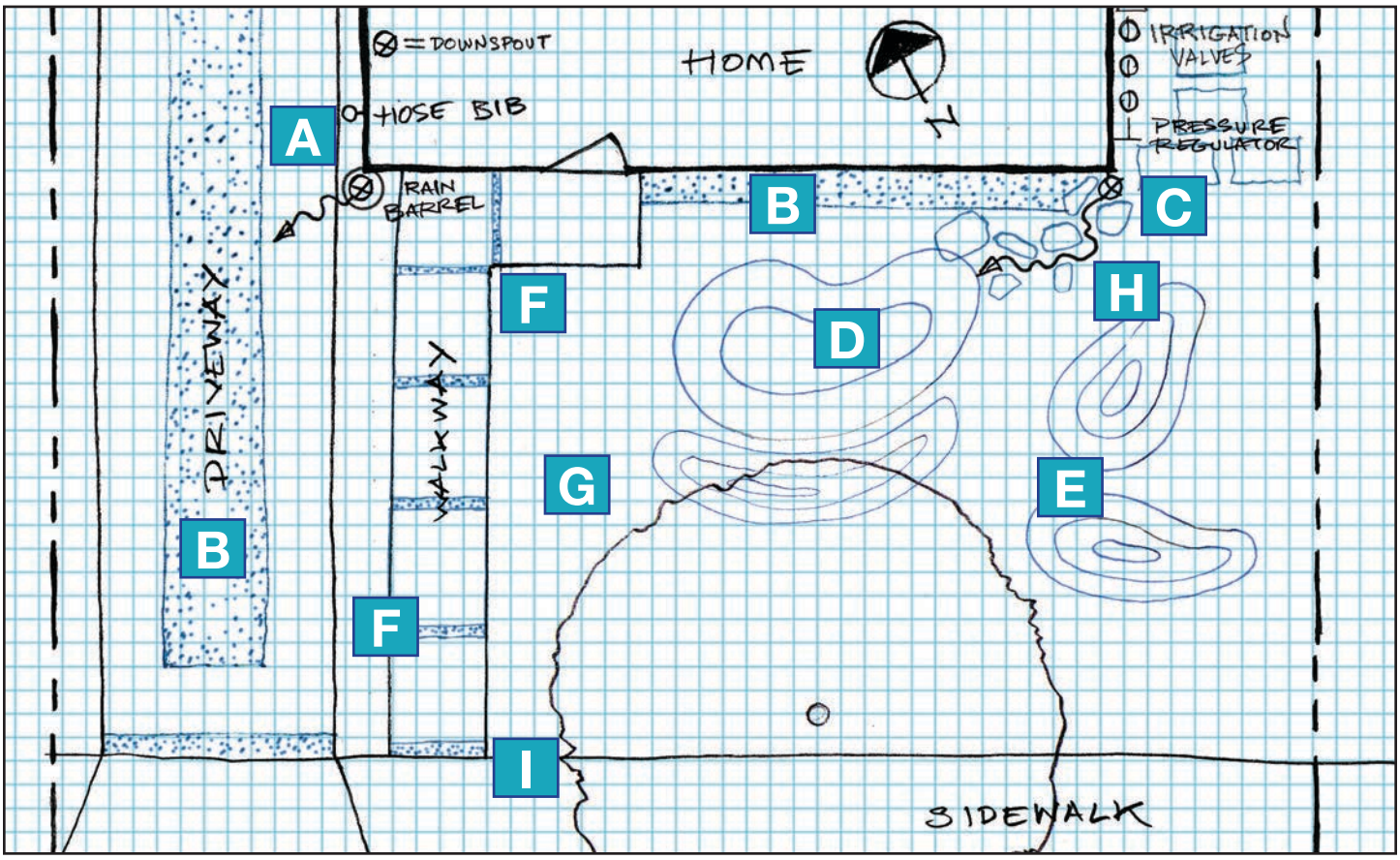
Imagine the water from your garage roof splits into two downspouts and Your Total Roof Area is 20' x 50' = 1,000 SF

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

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

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

Swales are Swell



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A **Downspout Redirected Into Rainbarrel** and away from the foundation of the residence. Overflow from rainbarrel slows down into gravel in the middle of driveway.

B **Concrete Removed and Gravel Installed** in middle of driveway and across the front of the residence. The 18" wide gravel area reduces erosion under roofline.

C **Downspout Diverted Into A Catchbasin** which is connected by perforated pipe into the swale area of the landscape. This should eliminate the pooling and erosion caused by the downspout.

D **A Slight Depression**, or swale, has been dug out in the middle of the yard in the area where water always pooled. This swale is only 12" deep in the middle.

E **Relocate Soil As Berms** when digging out the swale and the driveway area. Relocated soil becomes raised or mounded areas (berms) on either side of the depressed area. The berms become places for plants that like fast drainage.

F **Horizontal 4" - 6" Cuts** have been made in the walkway and across the end of the driveway and filled with 1/4" - 1/2" crushed gravel.

G **Living Soil** is being created with Sheet Mulching using 4" - 6" of mixed leaf and bark tree trimmings covering the whole yard.

H **Stones And Boulders**, most typically no more than 12" - 18" in diameter, are used to retain the edges of the swale and provide visual interest in the landscape.

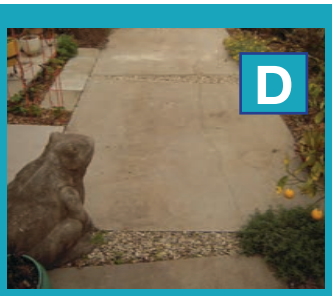
I **Overflow** of excessive rain should be directed through the garden and out to the street, not on to neighboring properties.

Images © Pamela Berstler, 2018

Rainbarrel with overflow into planter or permeable driveway

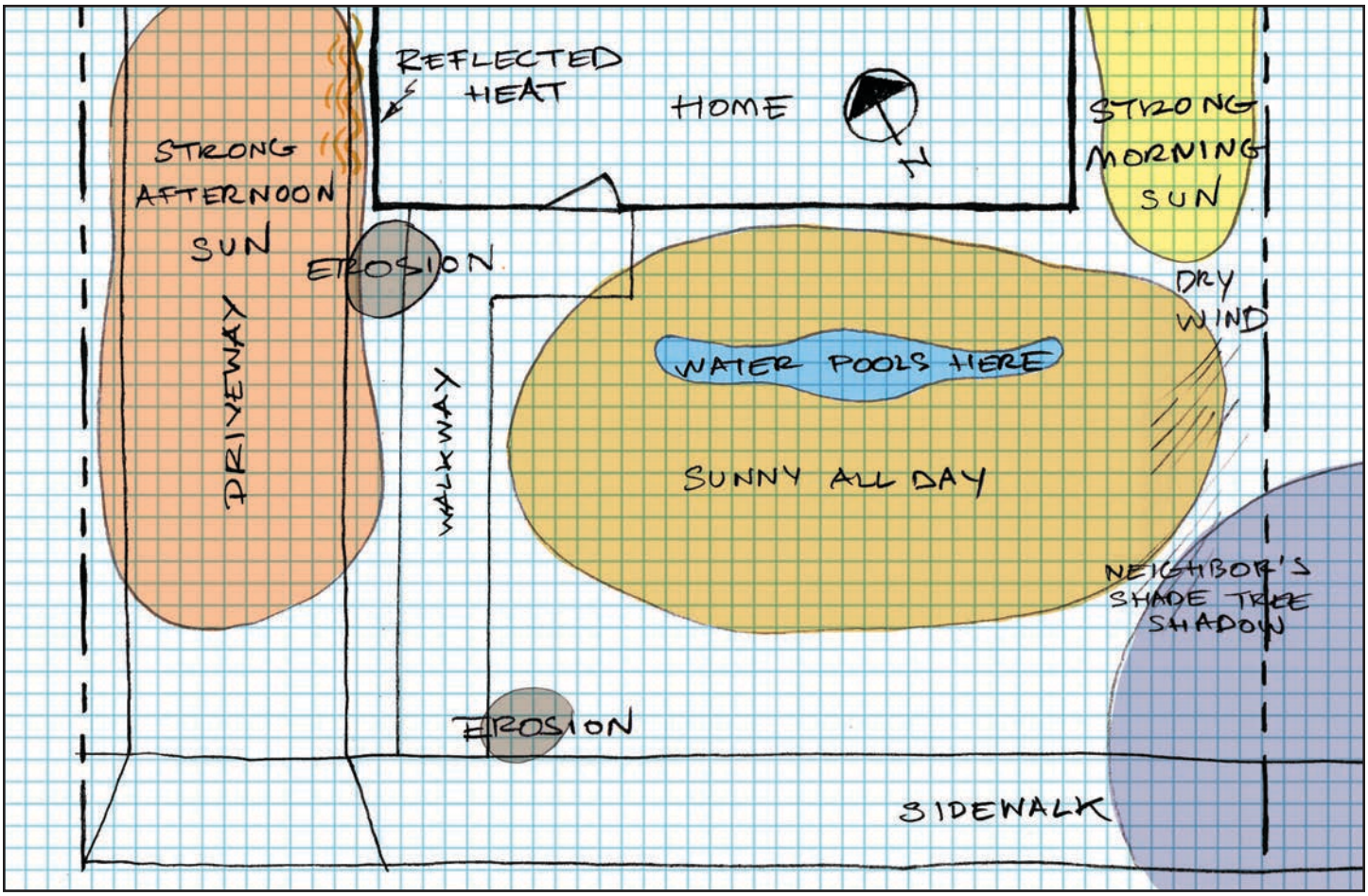
Driveway with middle section gravel

Downspout diverted into swale area through catch-basin and perforated pipe



Horizontal 4"-6" cuts in walkway and driveway

Consider your **Microclimates**



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Microclimates are your garden's **Hydrozones**.

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

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

Which Plants Will You Keep?

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

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

Note Sun and Shade

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

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

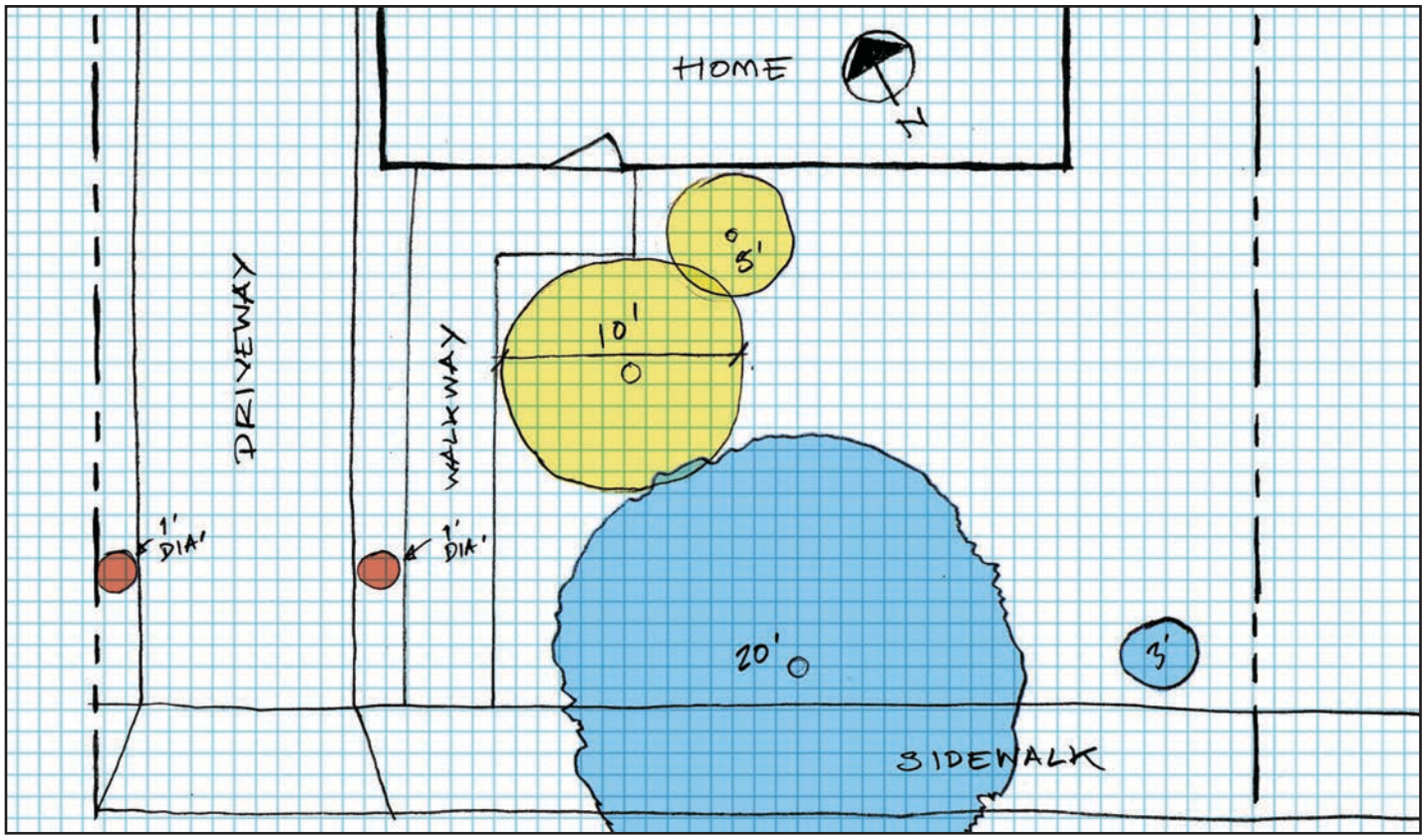
Are there other things you observe in your garden? Mark it on your Site Map!

Plants Speak Latin

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

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

Plant in the **Hydrozone**



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A Guide to Plant Water Needs : **Moderate** **Low** **Very Low**

Group Plants by **Water Needs**; plan for **Maturity.**

Proper plant placement, considering mature plant size, should limit the need for future pruning and reduce the amount of maintenance required in the long run. Natural forms are encouraged for habitat value, but fire prevention does require pruning and removal of dead, diseased, damaged and deranged plant material.

Scale Your Plants for Maturity

Make circles on your plan the size of the plant at maturity using a 1/4" = 1' scale (each box = 1').

Practice using colored paper to indicate the water needs of the plants. It will make it easier to lay out the planting plan in irrigation zones if you easily can move around the paper circles.

See on the plan how big the (VERY LOW water use) 20' wide canopy trees will be at maturity. Will this change the microclimates in the future? Think ahead if your new trees will cover a whole yard that's now sunny.

Play By The Hydrozone Rules

- Plants with similar cultural and water requirements should be planted together in order to irrigate them efficiently.
- Consider the soil, water needs, sun/shade and temperature requirements for each hydrozone.
- Each hydozone should be watered by a separate irrigation valve.
- Do not mix plants with different water requirements in the same hydrozone.
- Do not mix different irrigation types in the same hydrozone.
- The irrigation of each hydrozone should have matched precipitation (every nozzle needs to emit the same gallons per minute for spray or gallons per hour for drip).

Root depth matters

Make notes about the root depth of the plants when you are placing them on your plan. Trees, with their deep roots, will be irrigated less frequently, but for a longer time. Groundcovers with shallower roots will require more frequent watering. **Keep trees and groundcovers on separate hydrozones.**

Small plants are mighty

Once planted in a properly prepared bed, and watered wisely, small plants establish themselves more vigorously than plants raised in larger containers. But just because you've selected small plants, doesn't mean you need to buy more than the space allows when those plants reach maturity!

How much **Water** does your garden **Need?**

Evapotranspiration (ET) is the key to watering plants.

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

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

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

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

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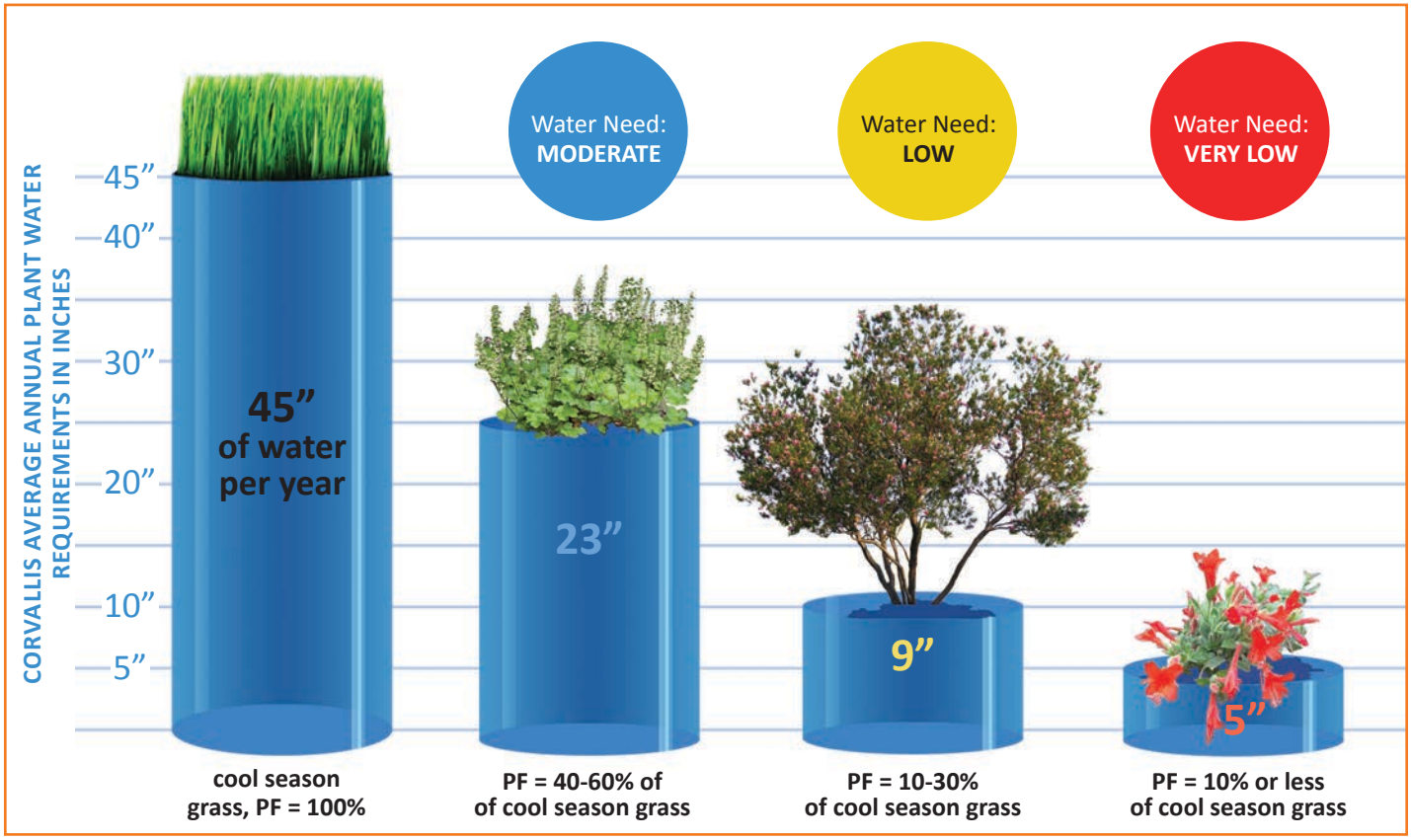


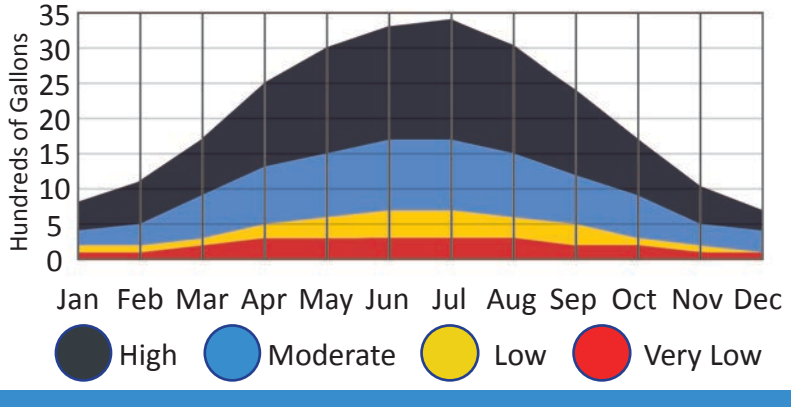
Reduce Landscape Water Need: Understand **ET**, **PF** and **IE**

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

In our 875 SF Front Yard, replacing **HIGH Plant Factor** cool season grass with **VERY LOW Plant Factor**, climate-appropriate plants saves about 32,000 gallons of water annually, without changing irrigation efficiency.

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

875 SF Landscape Water Need By Plant Factor



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How much **Water** can your new garden **Save?**

Calculate your landscape watering need in **Gallons.**

Our Front Yard Landscape Water Need:

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

Landscape SF = 875 Annual ET Inches = 45" Irrigation Efficiency % = 70%

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

Grass Water Need: **HIGH**

HIGH Water Need
Plant Factor = 100% = 1.0

875 SF x 45" x **1.0** ÷ 0.70 x 0.62 =
34,875 Gallons Annually

New Front Yard Water Need: **MODERATE**

MODERATE Water Need
Plant Factor = 50% = 0.50

875 SF x 45" x **0.50** ÷ 0.70 x 0.62 =
17,438 Gallons Annually

In our 875 SF Front Yard, replacing cool season grass with **MODERATE** climate-appropriate plants saves 17,437 gallons of water annually, without changing irrigation efficiency.

LOW Water Need Plant Factor = 20% = 0.20

875 SF x 45" x **0.20** ÷ 0.70 x 0.62 =
6,975 Gallons Annually

Replacing cool season grass with **LOW** Water Need plants saves 27,900 gallons of water annually, without changing irrigation. Change irrigation to drip with IE= 90% and save 29,450 gallons annually.

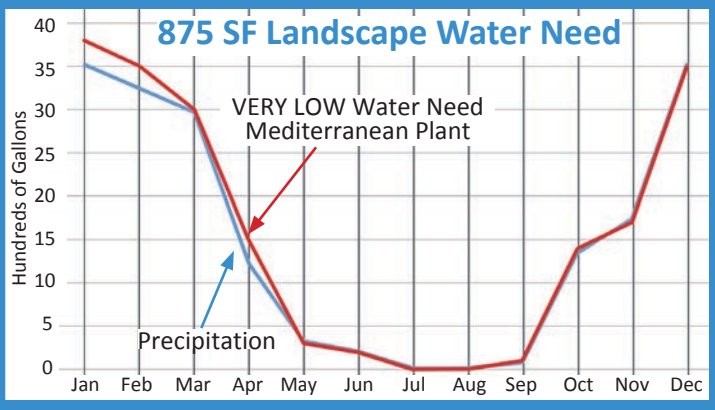
VERY LOW Water Need Plant Factor = 10% = 0.10

875 SF x 45" x **0.10** ÷ 0.70 x 0.62 =
3,488 Gallons Annually

Replacing cool season grass with **VERY LOW** Water Need plants saves 31,387 gallons of water annually, without changing irrigation. Change irrigation to drip with IE= 90% and save 32,162 gallons annually.

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

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



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

Image courtesy of Rain Bird Corporation

Image courtesy of Rain Bird Corporation

Spray Irrigation emits water in an overlapping (head-to-head) pattern.

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

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

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

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

Drip Irrigation delivers water directly to roots.

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

Installations of subsurface (or under at least 2 inches of mulch) systems may be the most efficient way to irrigate nearly every type of garden area. Since the tubing is flexible, it can be made to accommodate a wide variety of irregularly shaped areas or rectangular areas when laid in a grid pattern.

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

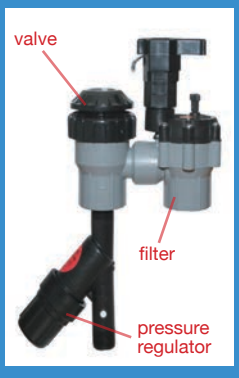
Challenges include the possibility that drip systems could apply water too quickly for the soil to absorb, so careful consideration is required especially when dripline grids are installed. Drip irrigation operates most efficiently at low pressure (between 15 and 30 psi). Optimal performance requires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

What is a Tattle-Tale?

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

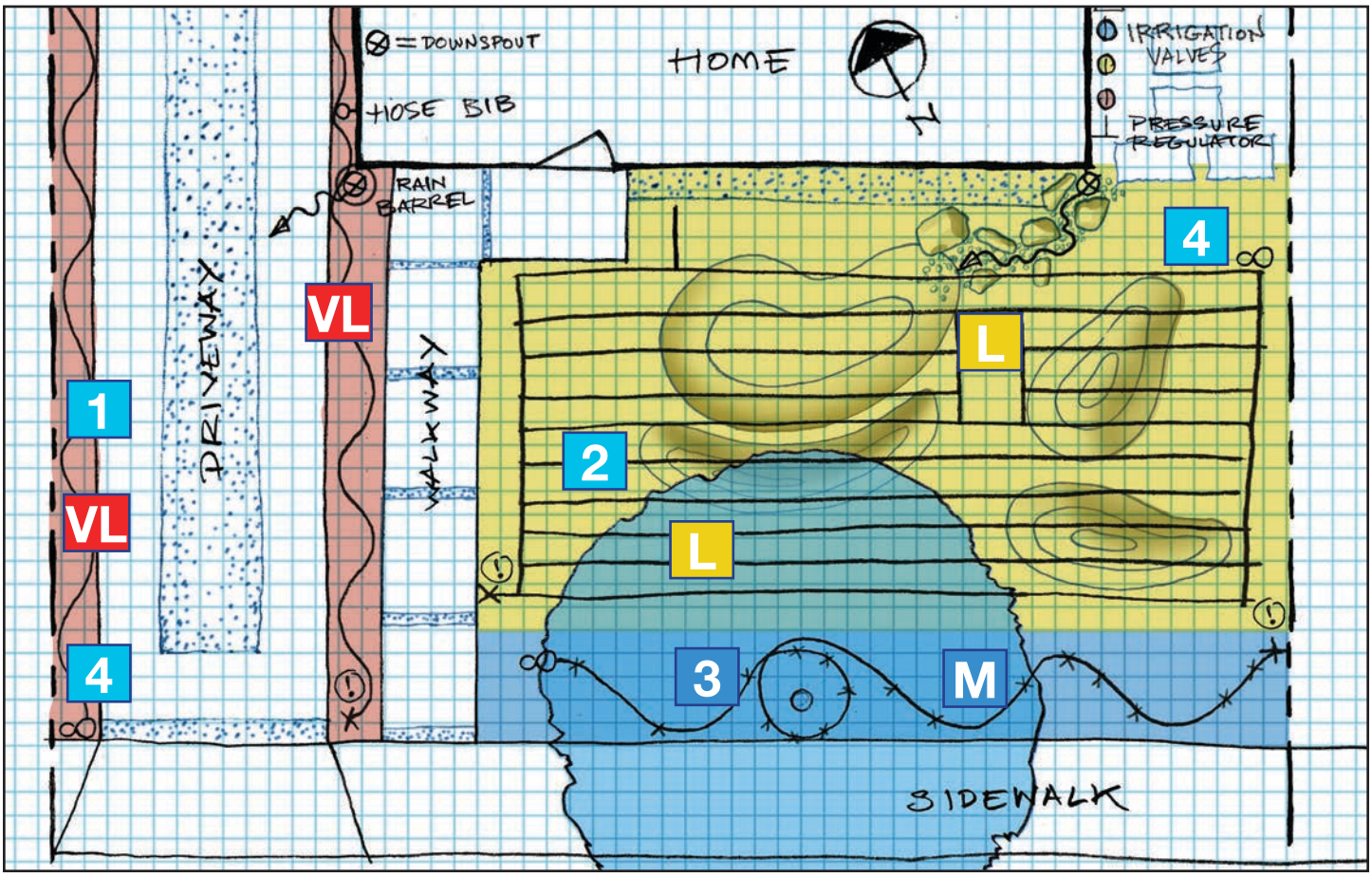
When the drip irrigation is running below the mulch, the tattle-tale will pop up and let you know that the irrigation is on.

What is a Low Flow Valve?



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

Match **Irrigation** to new **Hydrozones**



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Adjust Valve Zones to Hydrozones.

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

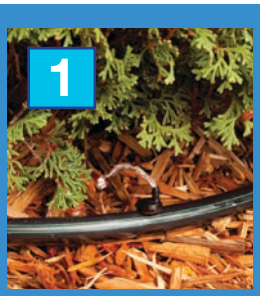
VL **VERY LOW** water use plants in the strips along the driveway will have **in-line drip irrigation in a random pattern** around each plant.

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

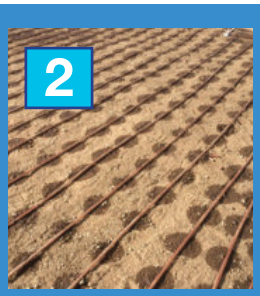
M **MODERATE** water use plants in the parkway will have an **on-line or "point source" drip irrigation line in a random pattern** around each plant; note that the tree gets special attention with an extra ring to accommodate its expected growth.

- **END FIGURE "8" FLUSH VALVE**
- **TATTLE TALE**
- **ONLINE DRIP LINE**
- **INLINE DRIP LINE**
- **MULCH OR GRAVEL**

Images courtesy of Rain Bird Corporation

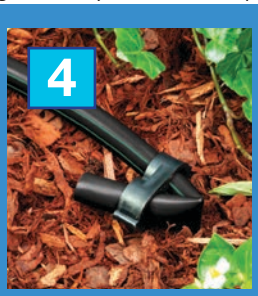


On-line drip emitter inserted into blank tubing



In-line drip grid emitters are built into tubing

Tree drip ring needs to expand as tree grows



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

Manage water for OWL

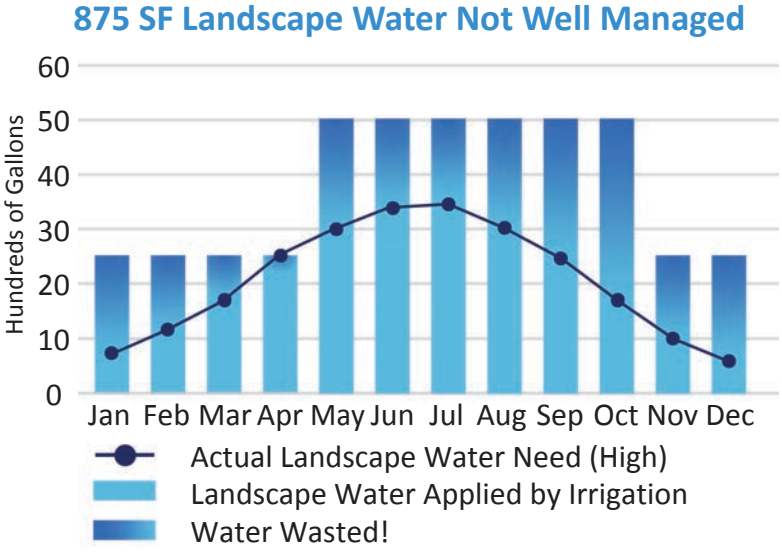
© Meiko Watkins, 2018

Balance your soil Moisture account.

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

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

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



Wet or Dry?

Use "digital" technology! Soil may appear dry on the surface, stick your finger into the soil and make sure it's wet below. If it's wet up to your second knuckle, it doesn't need any more water, so wait another day or two. Alternatively, if you use a soil probe, you can feel the moisture in the soil and make a determination yourself. You can look at plant health to determine water need, but sometimes overwatering and underwatering will produce similar symptoms in plants.

Underwatering Symptoms

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

Overwatering Symptoms

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

Plan for **Zero Runoff**

Keep Water in the root zone.

Observe the irrigation while running and check to make sure that no water is spraying or flowing onto sidewalks, patios or structures. If the water is being applied too fast for the soil to absorb, runoff will occur. Puddling and pooling also may be an indication that water is applied too fast or too often. Repairs to broken pipes and heads should be made immediately, or the system should be turned off until repairs can be made. The optimal time to water is in the late evening and very early morning. And, of course, irrigation systems need to be drained for the winter months.

look for WaterSense Meets EPA Criteria

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

Cycle and Soak Programming eliminates water runoff. Observe how quickly runoff occurs when you are running your irrigation. This is the MAXIMUM run time for your irrigation controller in this hydrozone. So, to cycle and soak your irrigation, you divide up the total minutes required by the hydrozone into blocks of time no longer than the observed runoff time and allow a 30 minute rest period in between the irrigation cycles. **For example, if we need 12 minutes of water in a certain hydrozone, but we observe runoff after 4 minutes, break down the 12 minute total into three 4 minute cycles with 30 minutes between each cycle.**

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

Hose Shutoff Nozzle

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

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

Pressure Regulation either for the whole house, or at each irrigation valve for each zone, eliminates excess pressure, and allows the irrigation system to run more efficiently. If you are keeping a spray system, pressure regulation will reduce misting and evaporative loss. With drip systems, pressure regulation is essential, because drip lines operate best at very low pressure.

What Is Irrigation Efficiency (IE)?

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

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

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

Tips for Eliminating Runoff

Several things can be done to minimize runoff due to irrigation. These include:

1. Convert planter area spray systems to drip irrigation with the lower precipitation rates, pressure regulation and a filter.
2. Tune up spray irrigation systems so there is no overspray on to hard surfaces.
3. Do not install spray irrigation in areas that are too narrow for spray (10' wide or narrower).
4. Move spray heads 24 inches from any buildings or hard and impermeable surfaces.
5. Cycle and Soak irrigation run times.
6. In lawn areas, be sure to follow the organic maintenance practices to keep your soil spongey.

These handouts accompany the November 2018 workshop:

The Watershed Approach:
Designing Drought Resilient Landscapes

sponsored by:

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APLD Oregon Chapter

ANLD
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The **Watershed Approach** to landscaping unifies landscape professionals, watershed protectors, water suppliers, planners, suppliers and developers with principles to solve the most pressing climate issues of our time including:

outdoor water/energy demand reduction (conservation)
water quality improvement and healthy water bodies for fish and fowl
carbon sequestration and the “healthy soils” initiative
wildlife and insect habitat protection and regeneration
urban greening and cooling
climate-smart regenerative agriculture
permaculture and re-wilding (bring back the beavers!)

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