

13

Managing Surfaces and Slowing Runoff

All surfaces require maintenance. Below are the maintenance requirements for the surfaces most commonly used in storm-water management; the land covers that slow runoff and increase infiltration.

This chapter deals with walking surfaces, mulches, overcoming compacted soils and maintaining the grade of a California Friendly landscape.



A California Friendly Landscape actively manages its surfaces, whether they be mulch, gravel, river rock, or DG. This picture illustrates good surface management. LADWP's headquarters, Los Angeles.

Walking/Driving Surfaces

Brick/Pavers: Vigorously sweep or vacuum pervious surfaces at least once a year, monthly is better. Do not hose or power-wash, as both will eventually create an impermeable layer of ultra-fine debris. Letting weeds grow and then flaming them will increase permeability. Brick or pavers not set in concrete will move, drop and lift, and every 4 to 7 years they will need to be removed, the area re-graded, and everything reset.



No permeable surface is without maintenance. Bricks and pavers need sweeping or vacuuming, weeding, and resetting. Huntington Beach.

Decking: Decks are great for stormwater management. They slow water, prevent the soil beneath from becoming compacted, and are made from renewable materials. Decks should be budgeted for replacement every 10-15 years, depending on climate, exposure, maintenance and use. If stained, wood will need to be repainted every 3 to 5 years.

Decomposed Granite (DG): As a walking surface (not mulch), DG will need maintenance at least once a year. DG moves and needs annual corraling and re-grading. DG also becomes muddy looking over time. When it does so scrape off just enough DG to get back to the original material and color. Moist, damp and/or shady areas attract molds, mosses and grime and will require more frequent scraping. Hauling in new DG for replenishment will be needed every 3 to 5 years, and

more frequently on any type of slope. If weeds are a problem, scrap, use a push broom or flame every 4 weeks, or before the weed sets seed. Avoid using any chemical on DG, including herbicides, because it can discolor the surface.



DG can get muddy looking over time. Scrap off and haul away just enough DG to get back to original material. Eventually, new material will have to be hauled in.

Dirt: Dirt is a great mulch, but a terrible weed suppressant. It can hold moisture, cool roots and provide nutrients. The smoother the dirt, the faster water runs, so grading soil so that it has slight rises and falls will slow runoff, allowing for greater rates of infiltration. If possible, leave a layer of natural debris on top of the soil to slow evaporation and protect it from wind erosion. Avoid excessive hoeing; it will degrade the soil.



This dirt thoroughfare allows easy access, is low maintenance, and the pine needles help suppress weeds. California State University, Fullerton.

Flat Stone: Broken concrete pavers and natural or recycled stone set in dirt or sand are common materials for pathways and patios. The gaps between stones need regular weeding and edging, and sometimes irrigating. Preemergent herbicides work well to reduce frequency of weeding. The soil between the gaps should be kept an inch below the surface of the stone to increase water-holding capacity and protect the plants from trampling. Stone not set in concrete will move and lift, and every 4 to 7 years the stone will need to be removed, the area re-graded, and the stones reset. Always protect fingers and wear gloves when working in the gaps.

Inorganic Mulches: Covered later.

Organic Mulches: Covered later.

Porous Asphalt / Concrete: Porous surfaces can lose 75% efficiency in 5 years through the natural accumulation of dust and fine debris. Cleaning is essential; monthly is best. Vacuuming is the most effective way of removing fine grit and debris. Next best is sweeping and blowing. Avoid high-pressure hoses because the spray will loosen the bonds and pry apart the aggregate, degrading the surface. Be sure to identify areas that contribute debris to the surface and try to reduce their impact. Avoid using fine mulches, select trees with little leaf drop, and, if there are surrounding areas with bare earth, plant or seed to cover them.



Both the porous concrete and pavers will need periodic vacuuming or sweeping to maintain efficiency.

Turf Blocks: Though beautiful and highly permeable, turf blocks require frequent maintenance. If not driven or walked on, the area will need regular mowing. Weeds are usually abundant and pulling or scraping are the most successful strategies to deal with them. The plants and soil will eventually grow over the blocks and scraping off the excess and reseeding may be needed every 5 years.

Mulches

Mulches provide incredible benefits—they slow evaporation, suppress weeds, enrich the soil, reduce topsoil loss, increase rainwater infiltration, regulate soil temperature, and/or make an area look more attractive. But they can cause problems, too.

Mulches can disguise irrigation problems. They can alter the chemistry of soil. They can not only shorten some plants' lives, but also favor non-native weeds. And some types of mulches can increase the ignitability of a landscape and become a liability in fire country.

Mulches can be used to great effect, but in order to do so requires understanding the differences between mulches and to align that understanding with a landscape's needs. Mulch recommendations are made in the Plant chapters for many California Friendly plants. Below are the most common mulches, their characteristics, and their best uses.

Mulches are grouped between organic and inorganic.

Inorganic Mulches

Inorganic mulches have grown in popularity. In some cases they are used for purely aesthetic reasons, in other cases they are used to suppress weeds and enhance plant health. They are an ideal mulch for many durable plants, such as California native shrub plants and cacti. Inorganic mulches require maintenance, although it is much lower than other land cover options.

Crushed Aggregate: Crushed aggregate and gravel are inexpensive and ideal for many types of Mediterranean landscapes. Aggregate moves and will eventually migrate out of its area. Replenishment of aggregate will be needed every 3 to 5 years. If replenishing, make sure that the aggregate has been washed of fine dust before laying over the soil; the dust will create a thin impermeable layer just below the rock. Gravel will work its way into a soil and landscape fabric is needed for separation. There is no way to keep weeds out and if not pulling or scraping, then flaming will be needed. At least twice a year blow the material to remove debris.



Chipped granite mulch has some advantages over DG. It does not get compacted like DG. It is not as compatible to weeds. And many people believe it looks better. It is also, however, more expensive than DG. Newport Beach City Hall.

Decomposed Granite (DG): DG is a good mulch for desert, Mediterranean and many California native plants. Unfortunately, non-compacted and non-stabilized DG is a perfect medium for many weeds. While weeds may be plentiful in this medium, they are also easy to control. Nearly every technique for eradication is effective. See the Weed chapter for greater detail.



Fiber rolls are protecting the sidewalk from the DG mulch. The DG should be removed. Not only does it have a tendency to travel on slopes, but it is easy to compact and quickly produces runoff. DG is ill advised on slopes.

Plastic Sheeting: Plastic sheets are laid over soil to reduce evaporation, increase soil temperatures, and suppress, if not kill weeds. The plastic, generally polyethylene, breaks down rapidly and can pollute the soil as it does so. Plastic sheeting should be pulled from the soil within 6 months. If long-term weed suppression is needed, then less toxic, more natural materials, such as cardboard and weed fabric are recommended.

River Rock: Though beautiful in appearance, ideal for Mediterranean plants, and a good solution for shady and windy areas, river rock has several disadvantages. For one thing, it is one of the most expensive mulches. It is also a difficult mulch to weed. Weeds will eventually root in the debris that has settled on the landscape fabric, and reaching in and around rocks to remove them makes weeding a time-consuming task. Flaming is an option if the rock is more than 6" deep and there is no leafy debris. Note, the smaller the river rock, the easier it is to weed. At least twice a year vacuum or blow the rock to remove debris.



River rock has many uses. The stone can help enable infiltration, become a walking surface, and provide strong aesthetic elements. Cal Poly Pomona.

Organic Mulches

Almost any organic residue can be used as mulch, but not all mulches are the same or have the same effect on a landscape. Listed below are the mulches most commonly used in Southern California, along with their best uses, ability to suppress weeds, and amounts of available nutrients.

Organic mulches come from milling operations (shavings and sawdust are an example), repurposed wood, such as pallets and construction debris, agricultural byproducts, such as manures and bedding, greenwaste collection, such as compost and recently chipped trees, or straight from the property, such as compost made from kitchen scraps and leaves. The pH of organic mulches ranges from neutral to slightly acidic, with coffee grounds, humus and peat moss being absolutely acidic. Manures will contain salt and might be alkaline.

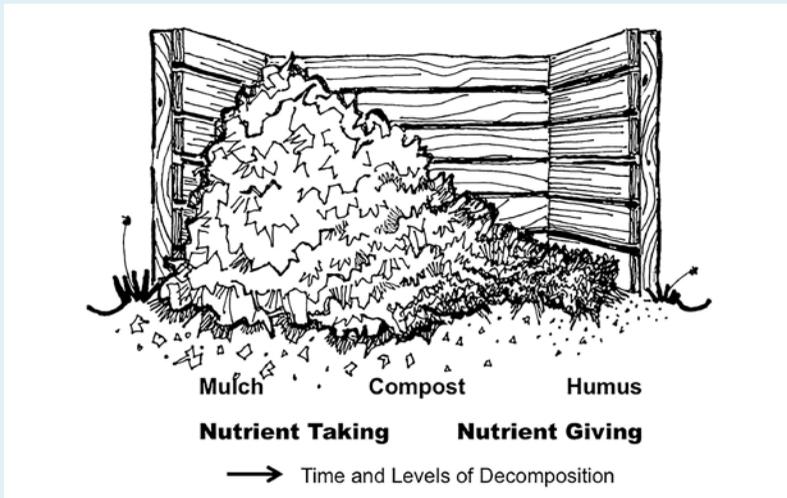
Bark: Bark is available in three sizes. Fine bark is a good walking surface and the fastest to decompose. Large bark is good for holding soil in windy, exposed areas. All bark will initially rob the soil of nitrogen. When bark is completely decomposed it will have contributed small amounts of nitrogen, phosphorus and potassium. Because of its expense, bark is not an ideal weed suppressant on large properties.

Burlap Sacks: Heavy and organic, burlap sacks are good at suppressing weeds and holding topsoil. These bags are cut open, laid on the soil, and sometimes held down with other mulches. If kept moist, burlap is quick to decompose, at which point it is either worked into the soil or pulled up and composted elsewhere. The sacks have little nutrients. Burlap can be purchased at craft stores. The sacks might also be available at coffee shops.

Cardboard / Newspaper: These materials are generally used to help smother a landscape. They are laid on top of soil or plants and then buried with a layer of mulch 4" or thicker. This is an effective strategy for weed suppression. The nutrient levels of cardboard and newspaper are low but when combined with mulch the soil will become much richer once the material has decomposed.

Deterring versus Nourishing Mulches

For purposes of simplicity, organic mulches can be divided between deterring and nourishing. Deterring mulches are used to suppress weeds and are woody, high in carbon, and made from materials that are slow to decompose such as eucalyptus and camphor. Deterring mulches will initially rob the soil of nitrogen and are slow to give it back. Nourishing mulches are used to support plant health and growth. They are in a further state of decomposition and contain all kinds of microorganisms and nutrients.



Deterring mulches are used as weed suppression on landscapes with low nutrient needs. They are commonly used around native, Mediterranean and succulent plants. Nourishing mulches are excellent for food crops, acid-loving tropical and temperate plants, and landscapes where plant productivity is either desired or required.



A 4" layer of woody course mulch will suppress weeds. It is too thick to support seed germination and it will initially rob the soil of nitrogen.

Colored Mulch: More expensive and decorative, colored mulches are made from woody debris and offer all the same benefits as non-colored. Color is provided by water-based dyes such as iron oxide and carbon black. Current research says that these dyes do not increase health risks to plants, soil organisms, pets or humans.

Compost: Compost is simply organic material that has decomposed. Ideally, the compost was brought to a temperature that kills weed seeds and pathogens. Compost does not rob nutrients from the soil, but typically is not decomposed enough to supply abundant nutrients immediately. The amount of nutrients in compost varies according to the materials that created it. Compost is great for nourishing landscapes, but it is poor at weed suppression.

Cocoa Hulls: Sweet smelling and attractive, cocoa hulls are an excellent mulch for landscapes close to people. They are more expensive than other mulches, though, which makes them primarily applicable to small areas. They are also somewhat poor at weed suppression. They may turn white with fungus if kept moist, but the material is good for the soil and poses no threat to people nor, generally speaking, to pets. Hulls are quick to decompose and release small amounts of nitrogen, phosphate and potassium. Cocoa hulls can be lethal to pets that eat a lot of woody mulch.

Gorilla Hair: Attractive and long lasting, gorilla hair is a mulch made from redwood shaved into thin long fibrous strands. It is fantastic as a walking surface. Gorilla hair has some drawbacks, however: it soaks up a lot of water, meaning less makes it into the soil; it is easily blown around a property; it is not a good weed suppressant because of its airy nature; and it is a very ignitable material. It will initially rob nitrogen and when completely decomposed it will provide a little nitrogen, phosphorus and potassium. Gorilla hair should not be used in fire hazard areas.

Grass Clippings: Because they contain moderate amounts of nitrogen, grass clippings should always be given back to a landscape. However, directly laying them down over the soil is not an effective way to do this. If the clippings are dry, then they will break down in the sun and blow about the property. If kept moist, they will create an acidic barrier on top of the soil. Both situations will cause nitrogen to be released into the atmosphere instead of the soil. Grass clippings should be composted and the nutrients returned as mulch.

Humus: Humus is finely decomposed organic matter that is nutrient rich. It is acidic and helps acidify soils. It is an excellent remedy for alkaline soils and the iron deficiencies that are a consequence. It is vital to organic food production. The amount of available nutrients in humus depends on the materials that were used to create it. Humus is not good at weed suppression.



Humus is called Back Gold by gardeners. It is finely decomposed organic matter, nutrient rich and slightly acidic. Most California Friendly plants require little more than humus for fertilization.

Leaves: Leaves have many benefits. They are probably the most abundant mulching material in urban areas. They have more nutrients than woody material. They are generally quick to decompose (though there are some exceptions, such as oak leaves). And they can be effective at weed suppression. Leaves high in oils (such as camphor, eucalyptus, juniper, and pine) are the best for weed suppression. A thick layer of broadleaf leaves in damp conditions can create an acidic barrier and prevent a soil from exchanging gases, ultimately undermining plant health.

Manure: Spreading manure over the top of soil is a practice thousands of years old. Manures can be rich in nutrients, readily decompose, and help improve the tilth of soil. However, as a mulch, manures are not the best. Their salts can damage plants; their odors offend neighbors, and they are not good at weed suppression. In urban areas manures are worked into the soil to improve its levels of microscopic life and nutrients.

Sawdust: Sawdust can be an attractive mulch, but it makes a better soil amendment because it tends to blow around a landscape. Fungus will develop on sawdust in damp conditions. It is not effective for weed suppression. Sawdust will initially rob the soil of nitrogen and when completely decomposed it will have contributed a little nitrogen, phosphorus and potassium.

Straw: Bright colored and attractive, straw is a good mulch around food crops because it does not hold moisture and will not cause rot. While straw will initially rob nitrogen, it does contribute beneficial amounts of potassium when decomposed. Straw is not so good at weed suppression. Straw should not be used in fire hazard areas.

Tree Chippings / Shredding: One of the least expensive mulches and the best for weed suppression, this material comes from tree service companies and is produced by chipping recently pruned vegetation. It will initially rob nitrogen and the amount of nutrients it returns depends on the amount of leaves in the chippings; the more leaves, the more nutrients.

Quick Tips for Applying Mulch

Amount: To get all the benefits of organic mulches (water conservation, weed suppression, etc.) no less than a 2" layer is needed; anything more than 4" is redundant. If a plant is prone to rot, keep mulches several inches away from its crown. Killing (smothering) the weeds already growing in an area requires a 6" layer of mulch.

Timing: Deterring mulches are generally needed no more than once a year. The best time to apply them is early winter, or just before weeds start taking off. Nourishing mulches may be needed twice a year. The best times are early spring, when plants need a blast of nutrients, and early fall, when the soil needs protection from rain and runoff.

Supplemental Nitrogen: If coarse woody mulches are used around nutrient-needy plants, it will be necessary to provide supplemental nitrogen because deterring mulches initially rob the soil of nitrogen. The added nitrogen will not only help maintain plant health, but also speed the decomposition of the mulch. Blood meal and fishmeal are excellent supplements. If nourishing mulches are used, such as compost, then nitrogen supplements are generally not needed.

Overcoming Compacted Soils

Compaction is the norm for urban soils. Too much water and too much traffic leads to compaction, and that leads to a soil's inability to exchange its gases, which in turn leads to lower levels of oxygen, acidic conditions and a landscape that is quick to produce runoff. All of these issues undermine the goals of plant health and resource conservation. Below are recommendations for overcoming compaction.

- **Keep Some Weeds.** The plants that colonize compacted soils are specialized early succession pioneers; they help prepare the area for the later successions by loosening and enriching the soil.
- **Cycles of Dry and Wet:** Letting a soil become bone-dry, saturating it, and then letting it completely dry again will physically break the bonds of compaction. Dense soils are expansive and will visibly rise and fall with this type of water schedule, eventually reducing compaction.
- **Redirect Traffic:** Directing traffic away from an area will help alleviate the source of compaction.
- **Mulch:** Laying a thick layer of woody mulch will help reduce compaction by distributing the weight of traffic.
- **Aerate:** Aeration, whether done by hand or by machine, is a quick and effective way to restore permeability. One or two inches of fine mulch or compost should be raked into an area after aeration.
- **Cover Crop.** Planting cover crops is an excellent way to break up compacted soils and load them with vital nutrients. Also known as green manures, cover crops are comprised of grasses, such as barley and oats, and annuals in the pea family, such as beans, clover, and vetch.
- **Turning Soil Mechanically:** Turning over the soil through brute force will absolutely reduce compaction. Whether by hand or a machine, organic material should be added to the turning process to help avoid compaction recurring again.

Maintaining Grade: Dry Landscapes Should Dip

Mounding garden beds are holdovers from a time when water was more plentiful in Southern California. We built up landscapes to help ensure plant health and improve aesthetics. But the health and aesthetics came at a cost. These elevated areas need more irrigation and are less capable of capturing rainfall and snowmelt. We can no longer afford to irrigate more and capture less. Southern Californians need to dip, rather than mound, their landscapes.

California Friendly landscapes sit below impermeable surfaces, such as driveways, parking lots and sidewalks. Any water that falls on a landscape will naturally flow to the plants, instead of pooling or running away. Below are the general characteristics of dipping the grade of a landscape.



Depth: Landscaped areas should sit no less than 1" below impermeable surfaces; 2" is better. Maintaining this grade will entail re-grading every 4 to 8 years. The buildup of soil with either have to be moved somewhere else on the property or hauled away.

Compaction: As soils go down, compaction goes up. The lowest areas of a landscape may need protection from water pooling, trampling and compaction. Shrubs and aggressive ground covers will help protect the soil and prevent compaction.

Irrigation: Lower lying areas need less irrigation than mounded areas; where a mound might require irrigation twice a week, a low area only once. Always let the soil dry to the plants' dry-to-depth, as discussed in the Irrigation and Plant chapters.



When this community was originally built the soil was below the grade of the structures. No longer. In a heavy rain this bugling landscape will shed water instead of absorbing it, endangering the homes, walkways and public safety.