



## CMG GardenNotes #245

# Mulching

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## Mulch and Soil Amendments

The term *mulch* refers to a material placed on the soil surface. By contrast, a *soil amendment* refers to any material **mixed into** a soil.

## Benefits of Mulching

Depending on the materials used, mulches can have many benefits. Mulch can:

- Reduce evaporation from soil surface.
- Increase soil microorganism activity, which in turn, improves soil tilth and helps lessen soil compaction.
- Stabilize soil moisture.
- Prevent soil compaction.
- Suppress weeds.
- Moderate soil temperature extremes.
- Control erosion.
- Increase water infiltration.
- Give a finished look, improving aesthetic quality.

## Edging and Soil Grade

It is a common practice to add mulch above grade level. Without a defined edge, the mulch can spread off the bed onto lawns or sidewalks, creating a mowing or trip hazard. **[Figure 1]**



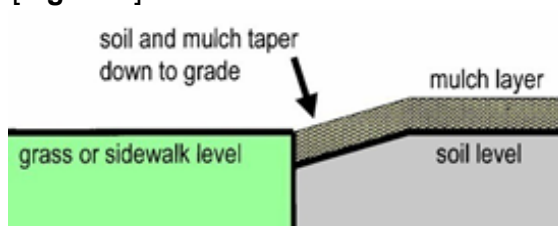
**Figure 1.**  
Mulch added above grade spills out onto the lawn or sidewalk.

An effective alternative is to drop the soil level on the mulch bed three inches, so the top of the mulch is at grade level. However, ensure that the mulched bed does not fill with water draining from higher areas. [Figure 2]



**Figure 2.** To keep mulch in place, drop the soil level in the mulch bed so the top of the mulch is at the grass or sidewalk level.

Another effective alternative is to round down the soil level along the edge of the bed. This gives a nice, finished edge at grade level, creates a raised bed effect for the flowerbed, and saves a lot of digging! [Figure 3]



**Figure 3.** An alternative is to taper the soil level along the edge of the bed.

## Wood Chip and Bark Mulch

Wood chip or bark mulch can be great around trees, shrubs, perennials, and small fruits as seen in **Figure 4**. Wood chip and bark mulches can create a favorable environment for earthworms and soil microorganisms. Over time, this helps reduce soil compaction.

In perennial and shrub beds, wood chip mulch can reduce the need for irrigation by as much as 50%. Mulching materials that mesh are more effective at reducing water evaporation from the soil. However, these same mulches are also effective at reducing precipitation infiltration into the soil. Be sure to install irrigation beneath the mulch and understand how water moves (or does not move) through your mulch for the best success. Bark mulches, particularly shredded bark products, are more resistant to water transmission than wood chips.

An important consideration for wood chip and bark mulch stems from the intense sunlight and typically dry conditions across much of Colorado. Wood chips exposed to high surface temperatures from intense sunlight can become hydrophobic, preventing water infiltration to the soil. Wood chip or bark mulch, therefore, is not recommended for use in xeriscapes or with open planting plants unless it can be frequently checked and distributed to maintain its ability to conduct water to the soil. Wood chips under a canopy of leaves or in regularly irrigated settings are typically not affected by hydrophobicity.



**Figure 4.** Wood chip or bark mulch in the perennial and shrub bed enhances soil tilth over time.

Wood chips or bark mulch can be less effective in areas with persistent winds, as even relatively large pieces can be blown away in gusty conditions. Plant cover and wind breaks reduce the susceptibility of the mulch to being blown out of landscapes.

Sometimes people can be concerned that wood chips and bark mulch will reduce nitrogen availability in the soil or that plant diseases or plant defense compounds that are present in the wood chips and bark mulch could harm landscape plants. Thankfully, claims of infertile soils and toxic mulch are not supported by much evidence.

When placed on the soil surface as mulch, wood chips and bark mulch do not tie-up soil nitrogen. However, incorporating wood chips or bark mulch into a soil can create a nitrogen deficiency. Soil microbes, which consume the wood, also require nitrogen; wood or wood products mixed into the soil can cause a population boom for microbes and result in a lack of nitrogen available for plants.

Buried wood can take ten or more years to decompose. Using nitrogen fertilizer can compensate for the nitrogen used in the decomposition process in order to remediate soils with wood chips or bark mulch already incorporated.

In vegetable or annual flowerbeds where the soil is routinely cultivated to prepare a seedbed, be sure to keep wood mulch from mixing into the soil. Rake the mulch away thoroughly before beginning and replace it when seedlings have sprouted (or once plants have been planted).

Plant pathogenic fungi can persist on un-composted wood chips but would need to travel into the soil in order to infect healthy roots of susceptible landscape plants. Wood chips that have been dried, as in the case of most purchased mulch, do not carry pathogens. Fresh mulch or mulch that remained damp from production to application could transfer pathogens into above-ground wounds or to roots if they were to come into contact with the mulch. This is another reason to avoid mixing mulch into the soil and to keep mulch from piling up around the stems and trunks of landscape plants. Furthermore, most common plant pathogenic fungi are ubiquitous in the environment and opportunistic. Susceptible plants in the right environmental conditions will likely develop disease regardless of the mulch. Keeping plants healthy by minimizing stress is a more fruitful way to prevent disease than fretting about mulch contamination.

In addition to pathogens, claims that plant secondary compounds from mulch will leach into soils and kill plants can be found in the popular press. “Cedar mulch” and mulch made from the wood of black walnut trees are often specifically cited. No evidence supports that any tree going by the common name “cedar,” including *Juniperus*, *Cedrus*, or *Thuja* produces allelopathic chemicals (compounds that function as herbicides on neighboring plants). While juglone, the compound in black walnut trees, can have harmful effects on certain plants, the compounds do not persist long in mulch. Using aged mulch and/or leaching mulch with water quickly mitigates any possible problems. Seedlings and shallowly rooted plants are more susceptible to allelopathic compounds; mature landscape plants are not likely to be affected in any case.

## Rock Mulch

Rock and gravel mulch are often maligned as not beneficial to plant growth. Because they are sometimes grouped together as a single product, conclusions about them from research can be hard to draw. For example, many studies do not specify rock size when discussing “rock mulch” in comparison to wood mulches. In studies that have differentiated among rock sizes, though, mulch with gravel less than one centimeter in diameter has been shown to suppress weed growth and reduce water loss from evaporation similarly to wood chip mulch. Additionally, surface temperatures in planting beds mulched with gravel remain cooler than paved surfaces or surfaces mulched with wood chips.

Landscapes in dry climates are most likely to benefit from gravel mulches. Pea gravel has been shown to improve water infiltration into the soil, especially in short, intense precipitation events like thunderstorms; larger rocks increase runoff. Even a thin layer of gravel mulch has been shown to

double the amount of precipitation that infiltrates the soil; a three-inch layer can increase water infiltration manyfold. In order to function as mulch, though, stones must be small enough – no more than around a half-inch in diameter. Larger stones do not confer the benefits of mulch.

Gravel mulch can improve the soil too – by increasing the available soil moisture and warming the soil temperature beneath it, plant roots and microbes get a boost. The increased biologic activity can result in improved organic matter content and subsequent tilth, even though the mulch itself does not decompose.

## Grass Clippings or Leaf Mulch

Grass clippings and leaves make good mulch when applied dry or when applied gradually in thin layers and allowed to dry between applications. Grass clippings and leaves decompose rapidly, requiring additional layers during the growing season but providing nutrients to soil microorganisms as they “compost in place.” A grass clipping or leaf mulch recycles its nutrients into the garden bed or lawn that generated it.

They are not as resistant to compaction as wood chips or gravel mulch.

Do not apply fresh grass in thick layers as it will mat, produce foul odors, reduce air- and water infiltration, and even become hydrophobic. Do not use clippings from lawns that have been treated with herbicides or other pesticides.

Grass clippings and leaves are an excellent choice in vegetable and annual flower beds that receive annual cultivation to prepare a seedbed. [Figure 5]

## Product Selection

The selection of a mulch depends on its intended use. Consider your goals and the size of the area in relation to the cost of materials and availability.

If the main objective is soil improvement, consider an organic mulch that gradually breaks down, like wood chips. If the area is used primarily for annual flowers, it often is more practical to use a quickly decomposing organic mulch, such as composted leaves or grass clippings, that can be turned under each fall. Make sure these materials have not been treated with persistent herbicides or they may damage your landscape plantings.

If the main objective is water infiltration or xeriscaping, consider rock mulch. Any stones used for mulch should be smaller than a half-inch in diameter for the benefits of water conservation and weed suppression. Larger stone sizes do not function well as mulches and can actually inhibit plant growth but may provide landscape interest.

Mulch changes the way that heat is transferred to the ground and surrounding structures. Gravel mulch transfers more heat to underlying soil than wood chip mulch. This may serve to keep landscape plants in better overall health in cold-winter temperate climates like ours. On the other hand, it can also transfer heat to buildings and utilities or cause some tender plants to begin growing too early in the spring. Wood chip mulch insulates the soil against temperature swings, but the surface temperature of sun-exposed wood mulch can be hotter than that of gravel mulch. Match your mulch to your situation.



**Figure 5.** Grass clippings are great for the vegetable garden and around annual flowers. Directly from the bag, place them around the plants in thin layers, allowing each layer to dry before adding more.

Black plastic (polyethylene) and woven plastic weed barrier fabrics (polypropylene) are not recommended beneath mulch in landscape areas. Black plastic is impermeable therefore no oxygen exchange can occur to the soil. Lack of oxygen to the roots and soil microbes significantly reduces plant growth. Black plastic also prevents water penetration. Woven weed barrier fabrics initially allow some minor oxygen and water exchange to the soil, but eventually become clogged and create the same issues. Weeds easily germinate on top of the fabric and root into or through it. Both plastic and woven plastic fabrics disrupt the life cycles of many pollinators and other soil invertebrates. Synthetic fabrics and plastic sheeting, *used alone*, can be good choices for large-scale vegetable production where regular maintenance and replacement is easily performed. In gardens and landscapes, the correct application of other mulches is a better option.

## General Use

- **Depth**

In order to suppress weed growth, wood chip, gravel, grass clipping, and other mulch should be four inches deep. More is not better, though! Applying mulch too deeply can reduce air exchange to the soil and reduce the growth of your desirable plants.

Mulch applied to the correct depth does not require underlayment with fabric, newspaper, cardboard, etc.; these products can interfere with water and air exchange in the soil. Choose the correct mulch, apply it deeply enough, and forget the fabric or newspapers.

- **Around Trees**

Wood chip mulch is great for trees and shrubs, protecting trees from lawnmower damage. However, do not make “mulch volcanoes” around tree trunks by applying chips up against a tree’s trunk, as seen in **Figure 6**. Wet chips piled up against the trunk can cause bark problems and interfere with growth. Keep the mulch back at least six inches from the trunk, and do not apply too deeply.



**Figure 6.** Never make a “mulch volcano.” It leads to decay of the bark and interferes with trunk taper. Keep mulch back six inches from the trunk.

## Converting Lawn to a Mulch Area

If a lawn will be changed over to a mulched garden bed, again consider timing, expense, and end-goal. Many techniques can be successful. Once a lawn is dead and gone, be sure to apply mulch in the new garden.

- **Spray With a Non-Selective Herbicide**

This method is a relatively fast, inexpensive, and easy way to kill your lawn. It maintains the soil’s structure and microbiology and leaves the organic content (dead grass and roots) in place to decompose. Because you are not disturbing the soil, weed seeds are not brought to the surface to germinate. Different herbicides have different risks and effectiveness. Read and follow the label instructions for safe application.

- **Solarize**

Water thoroughly and cover the area you want to kill with clear plastic, making sure that the edges are sealed. Leave it there for four to eight weeks. This method is most effective in the hottest months from June through August. It is not aesthetically pleasing and may invite complaints from the neighbors, but it is a low-effort option. Leave the dead grass or rake it

up. Avoid disturbing the weed seed bank by not tilling it in. Research has shown that there is only a temporary reduction in soil microbial activity from solarizing – the soil microbes quickly recover.

- **Mow Close and Cover**

In early spring, scalp the grass by mowing it as short as possible. A weed whacker works well for this. Then cover the area with a thin layer of compost and an eight to twelve inch layer of woodchip mulch. Water well to encourage decomposition. Many gardening sites recommend using layers of newspaper or overlapping pieces of cardboard. This will slow down an already lengthy process, and it temporarily reduces soil microbial activity which is important for soil and plant health. Be aware that this will take a season or more and still may not kill all of the grass.

- **Use a Sod Cutter or Dig It Up**

If your lawn is in good condition, you can cut strips with a sod cutter, roll them up and give them away. First, mow and water your lawn. Cut overlapping strips of sod and roll them up. Cut strips short enough to be moved easily. This method is quick but requires heavy equipment and you are left with the dilemma of how to get rid of the rolls of sod. Alternatively, you can flip the sod over to decompose in place, keeping the organic matter in your yard or garden. You then treat it like the 'mow and cover' method. Cover with compost, mulch, and water, to promote decomposition.

## **Mulch and Fire-Resistant Landscaping**

Mineral mulch (gravel) is the best option for making landscapes more fire-resistant. Organic mulch materials have a broad spectrum of flammability, particularly if ignition is from point sources like cigarette butts or spent fireworks. In low-wind conditions, moistened wood mulch resists ignition from such sources; dry wood chips, bark, pine needles, and other small-particle organic mulches are more ignitable. Larger and denser mulch pieces make for the most fire-resistant wood mulch. Rubber mulch will always burn and should be avoided.

The continuous, wind-driven accumulation of embers, as occurs in wildfires, will ignite any organic mulch. One study showed ignition and combustion of wood mulch with 83% moisture content in winds of only eighteen miles per hour. In rural areas and in the wildland-urban interface (WUI), choosing the right mulch (e.g., gravel or rocks) is an important component of creating defensible space.

## **Summary: Considerations in Selecting Mulch**

Gardeners often inquire about the best mulch. No one mulch is best for every situation. What is practical and available varies from gardener to gardener and within different communities. The following summarizes considerations in selecting mulches to ask yourself:

### **Site**

- Plants: trees, shrubs, perennials, annuals, specialty crops.
- Annual soil preparation: annual flowers versus perennial beds.
- Landscape goals and maintenance.

### **Function**

- Soil improvement goals and potential.
- Frequency of reapplication.
- Water infiltration and irrigation method.

- Depth needed for weed management.
- Appearance.
- Soil temperature (heating or insulation).
- Off-site movement by wind, water, and gravity.
- Safety (children, lawn mowers).

### Cost

- Local availability.
- Cost of product.
- Size of area to be treated.
- Depth of application.
- Transportation costs.

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