Mulch – What, Why and Wherefore

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What is Mulch?
Mulch is any material that is left on, applied to, or grows on the soil surface and influences soil characteristics and sometimes plant growth. Mulches can be organic, non-organic, and living. Mulching can occur naturally in forests or in gardens where leaves and organic debris are not removed. A lawn (turf) is an example of a “living” mulch, whether or not the lawn is ‘mulch mowed.’ The most common organic mulches used in the Pacific Northwest include bark products, yard waste compost, wood chips (arborist mulch), mint hay, and deciduous tree leaves. Non-organic mulches can be synthetic (plastic sheeting, geotextiles, and carpet) or natural (crushed rock). (OSU EC 1629-E, p. 1; L. Chalker-Scott, J. Environ. Hort. 25(4), p. 240)¹

Why Mulch?
Mulch’s job is pretty basic—to keep sunlight and some air off the soil and keep the moisture in. It’s possible to list many benefits of mulch, but six stand out: moisture retention, soil temperature modulation, weed control, soil health, plant establishment and growth, and aesthetic appeal.² Despite the obvious benefits, mulch can give rise to problems that the attentive gardener can avoid by choosing the right mulch and application for the gardener’s specific objective.

http://sonomamg.ucanr.edu/Sonoma_Gardener_Articles/Mulch--a_Gardeners_Best_Friend/ (Lyn Gannon, a Sonoma County Master Gardener)

Moisture retention
Mulch reduces irrigation needs by reducing surface evaporation and runoff, but it does not eliminate the need for irrigation, especially for Rhododendrons and other shallow-rooted, drought-sensitive plants. To maximize the moisture retention benefits, one should irrigate infrequently but deeply to moisten the soil below the mulch. Frequent, light summer irrigation may only wet the mulch and promote a shallow root system. Organic and non-organic varieties both cover the soil and limit evaporation.

Mulches with a high proportion of fine particles (e.g., sawdust or compost) or which form a fungal mat (e.g., non-shredded leaves) tend to compact (from traffic or rainfall) and repel water. This tendency is aided by soil microorganisms that release glues or waxes as they decompose organic mulches. Water will have difficulty penetrating hard surface mulches such as cardboard and will, of course, not make its

¹ The author has drawn extensively from publications by Linda Chalker-Scott (especially her 2007 article in the Journal of Environmental Horticulture, and Washington State University publication FS160E) and from Oregon State University publication EC 1629-E, by N. Bell, D.M. Sullivan, and T. Cook (2009)
² A potential benefit beyond the scope of this paper is pest and disease management.
way through plastic. Coarser mulches, including gravel and stone, which resist compaction and prevent water shedding, are a better choice for water retention. Coarse organic materials also decompose more slowly than fine-textured mulches and hold moisture for later release. Techniques to ensure proper water infiltration include shredding the mulching material, roughing the soil surface before adding mulch, and installing drip irrigation under the mulch.

**Soil temperature modulation**

Mulches keep soil temperatures cooler in hot weather and warmer in cold weather. Fine plant roots can suffer from temperature extremes. Temperatures that kill fine roots will rarely kill an established plant, but the condition can lead to chronic stress when the plant expends unnecessary energy to regenerate the fine feeder roots. New plantings that have not established a sufficient root mass that has pushed into deeper, more moderate soils may not survive a kill-off of the feeder roots at the surface. Once again coarse mulches (whether organic or non-organic) do a better job of moderating soil temperatures. Living mulches, such as cover crops or turf release water through evapotranspiration, cooling surface temperatures, but remove soil moisture for growth. In some cases, the gardener may want to warm the soil to get an early start on the growing season or to kill pests. Plastic mulches can raise or lower soil temperatures depending on the color and transparency of the plastic.

**Weed control**

Weeds are the gardener’s bête noire. They spoil our carefully tended beds and compete with our plants for nutrients. It may be disappointing to learn that there is no permanent solution, but mulching can help. While the weed control mechanism is not entirely understood, there are several probable phenomena at work. First, mulch blocks sunlight from reaching the soil without which young weeds cannot produce the sugars necessary for growth. Mulch can also prevent germination for those weed seeds that require light to germinate. Nor can small weeds push their way through 3-6 inches of mulch. Woody mulches may reduce the available nitrogen at the soil surface, preventing rapid weed seedling growth. Woody mulches may also control weeds through leaching of allelopathic chemicals in the wood. Finally, the use of mulches promotes beneficial organisms that prey on weeds or eat the seeds. Plastic or geotextile mulches may be more effective in blocking weeds because organic mulches will eventually break down and provide the nutrients necessary for weed growth. If weed control is a primary motivation for mulching, gardeners should avoid composted mulches because they contain more fine particles and more plant nutrients. Gravel, cobbles, and crushed rock, on the other hand, can be very effective weed control mulches, especially when applied at sufficient depth on pathways or beds. Nevertheless, as organic matter collects in the gravel, weeds will find a new home even if the gravel or rock is underlain with plastic sheeting or geotextile material.

**Soil health and fertility**

Healthy, fertile soil means healthy, growing plants. Mulch promotes soil health and fertility by encouraging an interdependent ecosystem.

- Organic mulch increases water content and retention, which stimulates microbial activity.
• Weed suppression reduces need for tillage, assisting beneficial soil microbes and detritivores.³
• Soil organisms use mulch for food as they break it down and slowly release nutrients into the soil, and some mulches attract earthworms.
• Larger size mulch, such as bark nuggets or wood chips, protects soil from compaction by rain and foot traffic & promotes water filtration into the soil.
• Mulch insulates the soil from ambient air and moderates soil temperature.
• It improves soil drainage & structure as it decomposes – breaking up clay soils and binding sandy soils over the long term.

The relationship of organic mulches to the underlying soil’s nitrogen content is complex.

• Organic mulches are a source of plant nutrients, which are released into the soil as the mulch decomposes, but they may not replace fertilizers altogether.
• The bacteria and fungi that break down organic mulch need nitrogen to survive. When these microbes decompose woody mulches with a high carbon to nitrogen ratio, they compete with plants for nitrogen available in the soil. Because mulches are applied to the soil surface, much of the nitrogen is removed from the top 3-6 inches of soil, possibly causing a nitrogen deficiency in small plants and recent transplants. Trees and established shrubs are usually not affected because they have deeper roots and nitrogen stored in their tissue to support growth.

Plant establishment and growth

Linda Chalker-Scott reports that there are “hundreds of controlled studies demonstrating that mulches improve seed germination and survival, enhance root establishment, and transplant survival, and increase overall plant performance.” (L. Chalker-Scott, J. Environ. Hort. 25(4), pp. 241-42)

Her conclusions in brief are:

a) Improved seed germination and seedling survival: The gardening conundrum is that we want to encourage desirable plants and discourage weeds from establishing, but mulches do not distinguish between “good” and “bad” plants. Thus, mulches that effectively suppress weeds are not appropriate for annual flower beds. Deeper mulches will not work in areas to be seeded rather than planted. A thin mulch layer will promote broadcast seed germination, but a deeper mulch will likely prevent germination. Organic mulches are a better choice for seed germination than gravel or other non-organic mulches.

b) Enhanced root establishment and transplant survival: The improved water retention and reduced weed growth provided by mulches allow roots of trees and shrubs to extend and establish beyond the trunk compared to bare soil. This beneficial effect is greatest with organic mulches compared to plastic or living mulches. Although plant roots will explore the mulch layer, the plant is not thereby damaged—unless the roots have colonized a geotextile fabric that is later removed.

c) **Increased overall plant performance**: Professor Chalker-Scott cites many field studies demonstrating better plant performance. The results show that organic materials perform better than non-organic ones.

**Aesthetic appeal**

Mulching not only keeps existing water trapped in the soil, it also keeps rain water from washing away soil and splashing unsightly mud on plants. It does this by breaking the fall of the water and therefore lessening the force when the water impacts the ground. Mulch can give a garden a finished look by filling in the empty spaces while being one of the easiest fillers to maintain. While living mulches may provide the desired aesthetic benefits, turf and groundcovers may take extensive care, such as mowing and watering, as well as competing for resources with other garden plants. Visually distinctive mulches (gravel, tumbled glass, wood chips) can control foot traffic by directing pedestrians through the garden.

**Which Mulch?**

**General considerations**

Gardeners should first consider what their mulch goals are—weed control, water conservation, temperature modulation, aesthetic appeal? The best mulch is one that fits the gardener’s functional and aesthetic needs, so the answer is not the same for everyone. Every type of mulch has strengths and weaknesses, making it suitable for some situations and not others.

**Living mulches**

A living mulch is a cover crop or ground cover that is planted to (1) suppress or out-compete weeds, (2) cover an open space, (3) prevent soil erosion, or (4) add soil nutrients and porosity by incorporating the living mulch into the soil. In agriculture a living mulch is a cover crop interplanted or under-sown with the main crop. Home gardeners use companion planting to support the growth of other plants by attracting beneficial insects, repelling pests, providing nutrients, shade, or support. Typically, living mulches or ground covers occupy a different garden niche than the desirable plants. Trees and shrubs, for example, have deeper root systems than ground covers or turf. If the living mulch is similar to other plants, such as herbaceous perennials, they may compete for the same limited resources.
For more information:

https://en.m.wikipedia.org/wiki/Living_mulch#Benefits ;
https://www.gardeningknowhow.com/edible/vegetables/cover-crops/living-mulch-ground-cover.htm ;

Non-organic mulches

Carpets

When using a non-organic mulch, aesthetics may not be the principal goal. Old carpets (synthetic or natural), for example, can suppress weeds and still allow a gas/water exchange with the soil. Mother Earth News explains how to use carpets in a vegetable garden here, but the result will not be picturesque.  https://www.motherearthnews.com/organic-gardening/garden-mulch-zmaz72jmazraw

Plastic Sheeting

Many master gardeners are familiar with the use of clear or colored plastic sheeting to achieve early start, moisture retention, or pest control results. Plastic sheeting is used extensively in agriculture. Plastic sheeting is utilitarian and temporary and not aesthetically appealing. It is beyond the scope of this paper to examine the use of plastic mulches in detail.

For more information:

Seasons Extensions Using Mulches (Oregon State Extension – Small Farms)
Plastic Mulch Primer (University of Vermont Extension)
The Use of Different Colored Mulches for Yield and Earliness (University of Connecticut IPM Program)
Using Plastic Mulches and Drip Irrigation for Vegetables (NC State Extension)
Geotextile fabrics

Geotextiles are permeable fabrics which can separate, filter, reinforce, protect, or drain. Typically made from polypropylene or polyester, geotextile fabrics come in three basic forms: woven (resembling mail bag sacking), needle punched (resembling felt), or heat bonded (resembling ironed felt). See https://en.wikipedia.org/wiki/Geotextile

Geotextile fabrics and plastic sheeting are effective at preventing germination of weed seeds below the fabric and in preventing the emergence of perennial weeds such as Horsetail. To avoid the unattractive appearance of fabrics and plastics most gardeners and landscapers cover them with a more aesthetically appealing mulch. Unfortunately, once the additional mulch is added, weeds grow in the mulch above the fabric or plastic so even these materials are not a permanent solution to weed control. Other problems are that some perennial weeds can grow up through a geotextile fabric or send roots down through the same fabric, which binds the fabric to the soil and makes removal difficult.4

Rubber

On the face of it, rubber mulch sounds like a great idea. It is available in different colors and can look a lot like wood or bark mulch. If applied properly it should suppress weeds, allow gas and water exchange, not attract pests, and last a long time. Unfortunately, it does break down over time if exposed to sunlight, but the most important drawbacks are its flammability and the leaching of heavy metals and chemicals into the soil. For more information and references see http://www.natureswayresources.com/infosheets/rubber.html

4 See Linda Chalker-Scott’s myth-buster on landscape fabric below.
**Crushed rock and gravel**

Gravel is a commonly-used mulch for garden paths and parking strips (picture on left). Crushed rock underlain by geotextile fabric is quite common in desert communities but is sometimes used as a garden bed mulch in Pacific Northwest Gardens to cover open spaces for weed suppression and aesthetic appeal (picture on right). The aesthetic appeal diminishes when the geotextile underlayment is exposed or when weeds colonize the rock.

![Crushed rock mulch pathways](image1)

![Crushed rock mulch on garden beds](image2)

**Cobbles**

*Cobbles used effectively in a parking strip*

Cobbles, also called cobblestones, derive their name from the word cob—a rounded lump of rock that is larger than a pebble and smaller than a boulder. Pacific Northwestern gardeners usually call this material river rock because most cobbles are collected from ancient river beds. It is quite common to underlay cobbles/river rock with geotextile materials, giving an unsightly appearance when the fabric is exposed. Another potential drawback is that if soil finds its way among the cobbles weeds will find a way to colonize the mulch. Applying a sufficient depth of cobbles and keeping it clean should help avoid the weed invasion.

Organic mulches

The mulch products most familiar to Pacific Northwest gardeners are organic. Many common mulches are sawmill wastes (bark and sawdust)—the fortunate consequence of living near extensive forest lands. Other mulches are generated naturally in our gardens and neighborhoods (leaves, needles, grass clippings, arborist wood chips). Some organic mulches result from other agricultural, industrial, or commercial activities (hay, straw, cardboard, newspaper, burlap, and coffee bags). These products are considered organic because they are derived from living materials, which biodegrade (decompose) over time by living organisms. Coarser organic mulches (bark nuggets, wood chips) decompose more slowly than finer particle mulches (needles, compost).

Mulches from the garden

Gardens with coniferous or deciduous trees and shrubs can create their own mulch (called detritus or duff in the forest) consisting of shed vegetative parts, such as leaves, needles, twigs, stems, and bark, in various stages of decomposition. This natural ecosystem comprises a biodiverse environment consisting of decomposers and predators that include invertebrates, fungi, algae, bacteria, and other microbes.5 Unfortunately, garden detritus may not fit with what some gardeners believe is a well-kept garden. Consequently, they collect all this material and send it off to a commercial composter that happily sells it back to them in a more aesthetically appealing form. Some gardeners compost this detritus and other yard waste on site for later use. While compost as mulch is undoubtedly beneficial for water conservation, soil health, and plant growth, its fine texture allows compaction, promotes weed germination, and does not modulate soil temperature as well as coarser mulches.

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5 Gardeners should be aware that unshredded leaves can form a mat that blocks water and air flow to the soil.
Crop residues (e.g., hay and straw)

Some gardeners may use hay or straw as temporary mulches to protect soil prior to planting a vegetable garden (for example), most crop residues are used as mulches in commercial agriculture, and so are beyond the scope of this paper. For more information, see, e.g., http://archive.unu.edu/unupress/unupbooks/uu27se/uu27se0c.htm (United Nations University Archive)

Shells

Sea or nut shells can perform many of the same basic functions as other organic mulches (water retention, temperature modulation, weed suppression), but are location-dependent. Oyster shells, for example (left picture below) may be available on the Oregon Coast but hard to find in the Willamette Valley. Hazelnut (Filbert) shells (right picture below) an be found in the Valley but not on the coast and may be available only during the processing season. Hazelnut shell vendors claim that slugs and snails will not cross the shells to attack vegetable gardens, but there is no scientific evidence to support that claim. Most importantly, the limited availability of shells will limit their use for most gardeners.

Wood products (bark, wood or arborist chips, sawdust)

Fortunately for Pacific Northwest gardeners, the lumber industry produces many by-products that are useful garden mulches. Bark is available from different conifer species (Hemlock, Western Redcedar, Douglas Fir) in the form of shredded bark, bark fines, medium bark nuggets, and large bark nuggets. As discussed heretofore coarse organic mulch is a better choice for moisture retention, weed control, temperature modulation, and resistance to compaction, but a big part of a gardener’s decision is the aesthetic statement, and that is an individual’s choice. Also available are landscape-quality wood chips, which have a uniform size and appearance. Many gardeners choose Western Redcedar chips for their aesthetic appeal and aromatic odor. Arborist wood chips are another organic choice and are often available free of charge so that arborists can avoid paying dump fees. (See https://getchipdrop.com for free arborist wood chips in the Portland Metro area). This material contains shredded leaves, needles, twigs, stems, and irregular wood chunks. These chips do not have a uniform look but provide all the
benefits of coarse mulch. Blueberry growers use sawdust (usually from Douglas Fir) as mulch, but sawdust is usually not a good choice for other home garden applications. The fine texture can cause sawdust to crust over and repel water, defeating the water retention benefit. The small particle size and faster rate of decomposition means that sawdust is less effective in suppressing weeds. Fresh sawdust can also injure bedding plants. (OSU publication EC 1629-E, p. 8)
Commercial or agricultural byproducts (cardboard, newspaper, coffee bags)

What could be more appealing to the frugal, ecologically-sensitive, latte-sipping gardener than to recycle materials in the garden, such as the continuous flow of Amazon cardboard boxes, piles of old newspaper (less common lately), and the coffee bags that bore the beans that ended up in your coffee cup? The demand for coffee also ensures a continuous supply. Even so, local roasters are forced to haul most of their coffee bags to the landfill. Master gardeners also learn that sheet mulches like cardboard and newspaper can be used to kill off grass for a future vegetable garden or suppress the weeds that threaten to overwhelm it later in the season. What are the pros and cons of these mulches?

Start with coffee bags, currently a popular item among master gardeners. Not to be confused with retail coffee bags, the agricultural kind are made of jute and are used to store and transport coffee worldwide. [https://en.wikipedia.org/wiki/Coffee_bag](https://en.wikipedia.org/wiki/Coffee_bag) The open weave of the bags means they are breathable, which prevents condensation and spoilage of the contents. When used in the garden the open weave facilitates the exchange of water and air with the soil. The downside is that coffee bags suppress weeds
only temporarily and do not decompose uniformly, leaving lots of partially decomposed pieces to deal with. Nevertheless, when secured with garden staples they can serve a useful purpose in stabilizing slopes and demarcating garden paths.

What about using cardboard and newspaper as mulch? The biggest objection that many gardeners have is the unsightly nature of sheet mulch, so most gardeners restrict the use to vegetable gardening or new plantings where the aesthetics are a secondary consideration. Before converting all those Amazon cardboard boxes to garden mulch, consider some of the potential drawbacks of using cardboard or newspaper sheet mulches identified by Professor Chalker-Scott in her paper (below) on paper-based sheet mulch myths. Undoubtedly, cardboard and newspaper mulch can suppress weeds effectively, but cardboard and compacted newspapers can also form a barrier to effective water and gas exchange with the soil. While a thin layer of newspaper or shredded newspaper will decompose effectively, cardboard mulch leaves behind lots of leftover, partially-decomposed pieces.

Coffee bags as mulch in raised beds  Newspaper mulch around new plantings

Cardboard pathway between tomato plants  Cardboard overlapped to kill grass for new garden

Organic mulch resources


http://www.mulchandsoilcouncil.org/ (industry standards & education; see mulch selection guide)

https://extension2.missouri.edu/G6960 (see table of mulch characteristics and values)


How, when, and how much?

Begin a mulch application before annual weeds are established. If concerned about nutrient deficiencies, put down a layer of compost before applying the coarse mulch. A spring mulch application will smother young seedlings and prevent seed germination of annual weeds. Mulch woody ornamentals in March or April since mulch applied in summer after soil is dried out is not as beneficial. In fact, fall mulching is even better to smother winter weeds, decrease runoff, and increase soil retention for the following summer.

If weed suppression is the goal and the site is covered with weeds, a non-chemical way to prepare the site is to mow the weeds as closely as possible and apply 3-6 inches of (preferably) coarse, organic mulch. Pulling weeds from unprotected soil can disturb the soil and increase erosion in sandy or sloped areas. Weeds that poke through the mulch can be pulled without disturbing the soil because of the protection provided by mulch. Research shows that weed control and plant growth are directly related to mulch depth, and that shallow mulch layers will promote weed growth. Keep mulch away from tree and shrub trunks and root flares (see Mulch Problems, below). Mulching does not solve all weed problems. It will not control perennial weeds such as Himalayan/Armenian Blackberry (*Rubus armeniacus*) or Horsetail (*Equisetum arvense*). Gardeners must control these weeds before mulching and expect to engage in further hand-to-hand combat or chemical control even after applying mulch. (OSU EC 1629-E, pp. 2-3; WSU FS160E, pp. 3-4)

Bee Smart

Gardeners know the important role pollination plays in producing seeds and ensuring uniformly shaped fruits and vegetables. While the diversity of insect pollinators is quite extensive and includes flies, butterflies, and moths, bees are, by far, the primary pollinator of many fruits and vegetables. The hairy body of the bee and its ability to flit quickly among flowers makes it perfectly adapted for the job of pollination. Almost all bees rely on pollen as their only source of protein and for other essential nutrients. While attracting pollinators is beyond the scope of this mulch discussion, the gardener’s thoughtful application of mulch can help to create bee-friendly habitat.
There are roughly 20,000 native bee species worldwide, of which there are about 4,000 in North America. Somewhere between 800-1000 bees are native to the Pacific Northwest. Seventy percent of those native bees are ground-nesting species. A gardener who covers all the bare ground in the garden with 4-6 inches of mulch to gain all the benefits of mulch will also have eliminated all possible habitat for native, ground nesting bees. Since that same garden depends on bees for pollination, what can a gardener do to get the benefits of mulch while providing pollinator-friendly habitat?

The U.S. Department of Agriculture, in a 2007 Agroforestry Note said, “The precise conditions – soil type, soil texture, degree of compaction and moisture retention – needed by most ground-nesting bees is not well known.” Nevertheless, the USDA provided two specific recommendations:

- Avoid turning over the soil, since ground-nesting bees need stable soil. The more surface area that is left untilled, the more likely such bees will find and colonize nesting sites.
- Clear some vegetation from a gently sloping or flat area without increasing the risk of erosion. The site should be well drained, in an open, sunny place, and, preferably, on a south-facing slope. Create a variety of partially bare patches since different ground conditions – from vertical banks to flat ground – will draw different bee species.

More recently, scientists have made progress in determining what habitat attributes are important for ground-nesting bees. Here are some rough rules of thumb to follow to provide for pollinator habitat when applying mulch.\(^6\)

- Ground-nesting bees like sunny areas; they need the sun’s warmth to fly around the garden visiting the blooms. These bees will not nest in full shade. Although partial shade may be acceptable, researchers find more bees in sunnier gardens.
- These same bees need some bare, or nearly bare soil, in those sunny areas to make their nests, although they may find that some garden detritus left on the ground will allow them to reach the soil and provide some protection.
- Finding a balance between mulching and providing bee habitat is important. Gardeners should look for a few sunny areas where the soil has not been tilled and there is little or no mulch (other than some garden detritus).

Pollinator resources (see also scholarly articles below)


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\(^6\) These recommendations were provided by Gail Langelotto, Oregon State University Associate Professor, Horticulture and Statewide Coordinator, Extension Master Gardener Program, in response to the author’s email inquiry.
Mulch Problems

Some mulches, such as straw, sawdust, or other wood products have a wide carbon to nitrogen ratio, which may at first affect plant growth negatively because the bacteria and fungi that decompose the materials may remove nitrogen from the surrounding soil. Any such impact is reduced if such materials are placed on the surface and not mixed into the soil. Alternatively, either apply a layer of compost before mulching or add fertilizer to offset any potential nutrient deficiency. To avoid most nitrogen deficiency issues, use mulch only as a top dressing; do not mix organic mulch with the underlying soil. Mulch will not resolve garden drainage problems and may contribute to an anaerobic soil condition harmful to plant roots. Poor drainage can be an opportunity to add plants that tolerate wet conditions or a dry stream bed.

The most serious mulch problem is the improper application around trees and shrubs. Piling up mulch against a trunk does not kill the tree or shrub immediately, but it is a leading cause of death for azalea, rhododendron, dogwood, boxwood, mountain laurel, hollies, cherry trees, ash, birch, linden, spruce, and other landscape plants. Why?

- **Oxygen starvation** – Tree root suffocation is the most common cause of tree and shrub death due to over-mulching, especially from repeated applications. The soil below the mulch can become water-logged because of a lack of evaporation, starving a plant’s roots of the oxygen needed for respiration. Symptoms may include yellowing foliage (chlorosis), abnormally small leaves, poor twig growth, and dieback of older branches. Once such symptoms occur, the plant is usually in a state of irreversible decline.

- **Inner bark (phloem) death of aboveground root flares** – The tissues of the trunk and root flare system cannot survive a continually moist environment; they need to breathe through lenticels. When mulch is piled near trunks, gas exchange decreases, stressing and ultimately killing the phloem. This problem can also happen when trees or shrubs are planted too deeply, burying the root flare. Gardeners should be aware that pop-up sprinklers can contribute to the problem by continually saturating the mulch against the trunk.

- **Disease** – Fungal and bacterial diseases that need moisture to spread and reproduce can find a friendly environment in the moist, decaying bark tissue under the mulch. Eventually these
diseases invade the inner bark, starving and finally killing the plant. This process may also be accompanied by an invasion of bark beetles and borers attracted to the stressed plant.

- **Excess heat** – Much like composting, the wet mulch layers against the trunk can heat up as the bark begins to decompose, reaching temperatures that can directly kill the inner bark of young plants or prevent the hardening off period in fall in preparation for winter.

- **Other potential issues** – Piles of mulch next to trunks may provide cover for chewing rodents to overwinter under the warm mulch and to chew on the nutritious inner bark. Continuous use of the same kind of mulch may affect the soil pH, which, in turn, can affect plants that are sensitive to changes in soil acidity. Finally, mixing mulch into the soil around plants can result in nitrogen deficiency. Since mulches typically have little nitrogen, bacteria will draw nitrogen from the soil. This should be only a temporary condition.


[https://www.umass.edu/urbantree/factsheets/9mulchingtrees.html](https://www.umass.edu/urbantree/factsheets/9mulchingtrees.html)

### Mulch myths

Linda Chalker-Scott is undoubtedly the Pacific Northwest region’s biggest mulch advocate and mulch myth-buster. Her Horticultural Myths website discusses those myths in depth. Here are condensed versions.

- **Myth of pathogenic wood chips** – Healthy soil communities have diverse fungal and bacterial species, many of which are symbiotic partners of plant root systems. These beneficial species can outcompete pathogens as long as soil conditions remain optimal for root growth. When soils become compacted and anaerobic, plants decline and become susceptible to opportunistic pathogenic microbes—always present but inactive in healthy soils. Given the distance between potentially diseased wood chips used as mulch and plant roots, it’s doubtful that pathogens would travel far under healthy soil conditions.

- **Myth of [negative] allelopathic wood chips** – Although Black Walnut (*Juglans nigra*) wood chips contain the compound juglone, which is known to kill plant competitors, other tree wood chips, especially those of Western Redcedar (*Thuja* spp.) or true Cedar (*Cedrus* spp.) are getting a bad rap. Cedars have developed chemical weapons against a number of pests and pathogens (e.g., thjaplicin and thujone), there is no evidence that these substances harm plant tissues, especially in established landscape plants. However, seeds or seedlings of desirable species may be more sensitive to mulch suppression since they do not have established root systems.

- **Myth of landscape fabric** – Landscape fabric, or geotextiles, might seem to be the holy grail of weed suppression—reduces herbicide use, allows gas and water exchange (unlike plastic sheeting), non-biodegradable, and a permanent solution to weeds in the landscape. Unfortunately, geotextiles do degrade when exposed to sunlight, and can be colonized by weeds
and landscape plant roots, especially if overlaid with soil or other organic mulch, making removal difficult.

- **Myth of paper-based sheet mulch** – While newspaper or cardboard are organic, they have significant drawbacks in the landscape except for annual or vegetable beds. These sheet mulches can harbor pest (termites, voles), can be dislodged by wind, can induce anaerobic soil conditions if compacted (inhibiting gas and water exchange), can cause water runoff if dried out, are not aesthetically pleasing if exposed, and are no more effective that wood chips or bark in suppressing weeds.

- **Myth of phytotoxic yard waste** – According to some sources uncomposted yard waste can harm plants and water quality. It’s important to distinguish between yard waste from the garden and immature compost from other sources (like municipal solid waste and manures). Yard wastes are not rich in nitrogen and can lead to nitrogen deficiency if used as a soil amendment rather than as mulches. There is no evidence that decomposing yard wastes contain phytotoxic compounds or pose a hazard to water quality. A caution is that yard wastes containing pesticides or diseased plant material should not be used as mulch.

- **Myth of rubberized landscapes** – What to do with an annual mountain of 300 million scrap tires? Tire manufacturers and distributors have come up with the seemingly brilliant idea of turning them into a permanent, aesthetically pleasing mulch. Unfortunately, rubber mulch is not as effective as other organic mulches in controlling weeds, is highly flammable, decomposes, and is not permanent, and contains many toxic elements with known environmental and human health effects.

  https://puyallup.wsu.edu/lcs/ (Linda Chalker-Scott’s Horticultural Myths - nine mulch articles)

**Conclusion**

Mulch can provide many benefits, both functional and aesthetic. Savvy gardeners will consider their goals for mulch in the garden before deciding which mulch to apply to different areas of the garden. For most ornamental gardens west of the Cascades a coarse organic mulch will achieve most of the functional benefits while providing an appealing complement to trees, shrubs and perennials. Vegetable gardeners may place more value on the functional aspects of mulch (including cover crops) than on the aesthetics.

**Selected Scholarly Articles**


