



Landscape Mulches for Upper Midwestern Landscapes

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Anyone involved in gardening, landscape installation or landscape maintenance promotes mulching. Done properly, mulching can improve the health and vigor of landscape and garden plants. Organic mulches also can improve the structure and fertility of the soil. Done improperly, mulching actually can stress plants into decline and eventual death. This publication will address the materials commonly used in mulching, the benefits of mulching properly and what happens when mulching is carried out improperly.

Mulching Materials

Gardeners and landscapers have two basic choices for mulch — inorganic and organic. Inorganic mulches consist of geotextile fabrics, lava rock, river stone and even pulverized rubber — all of which do not decompose to any noticeable extent. This makes them ideal for low-maintenance landscapes and a preferred option for many in the landscape contracting business. These mulches do not provide any structural benefit to the soil, and in some cases, they can heat the soil to a temperature that is lethal to surrounding plants.

Organic mulches are plant-derived materials and include bark nuggets, wood chips, shredded wood, conifer needles, leaves, grass clippings, newspapers, straw and even cocoa hulls. Being organic, these products are all subject to some microbial activity that eventually breaks them down. This requires reapplication on an annual basis to maintain the desired appearance. The “organic tea” that comes from such breakdown benefits the soil structure under the mulch by increasing the macropores, which improves the water and air balance in the root zone.

Benefits of Mulching

The major benefit of both the inorganic and organic mulches is the weed control that results. Because the mulches keep light from weed seed, germination either is eliminated or greatly reduced. Any weeds that do appear can be pulled easily or spot sprayed with a herbicide (e.g., glyphosate — Roundup). Another benefit of proper mulching is a more uniform moisture regime in the root zone of the plants, which results in better growth. Proper mulching also can protect the developing roots of young plants from wide fluctuations in temperature and moisture, preventing heat or cold stress with early transplants.

In some instances, a combination of inorganic and organic mulches is used in landscape settings. A geotextile fiber is placed around the plants and usually covered with bark nuggets for appearance and optimal low maintenance. In this instance, and possibly other situations where the landscape would be subject to wind forces, the bark needs a tackifier over it to keep it in place.

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Mulch Volcanoes and Other Mulching Disasters

How much mulch is enough and how much is **too** much? Annual plants such as vegetables and flowers need only a light covering of organic mulch, 2 to 3 inches. More than that could result in anaerobic (oxygen-deprived) conditions developing in the root zones of the plants. If the soil is a heavy clay that tends to stay wet for long periods after a rain or irrigation event, then any kind of mulch would be detrimental, as the plants in such a situation need as much oxygen migrating to their roots as possible.

Woody plants typically have a much deeper and more extensive root system than do herbaceous plants. Mulches up to 4 inches deep can be used in these settings without adverse effects on the plant material. When in doubt, go lighter rather than heavier. When applying mulch around woody trees and shrubs, keep mulches away from the trunks of trees and shrubs that just have been planted, and up to 6 inches away from the trunks of mature trees. If possible, place the mulch ring out to the drip line of the tree.

“If some is good, then more is better.” This often is an assumption of grounds crews attempting to maintain an attractive landscape setting. The result literally is a mulch volcano where the mulch is stacked and sloped against the trunk of established trees. While it may be considered attractive

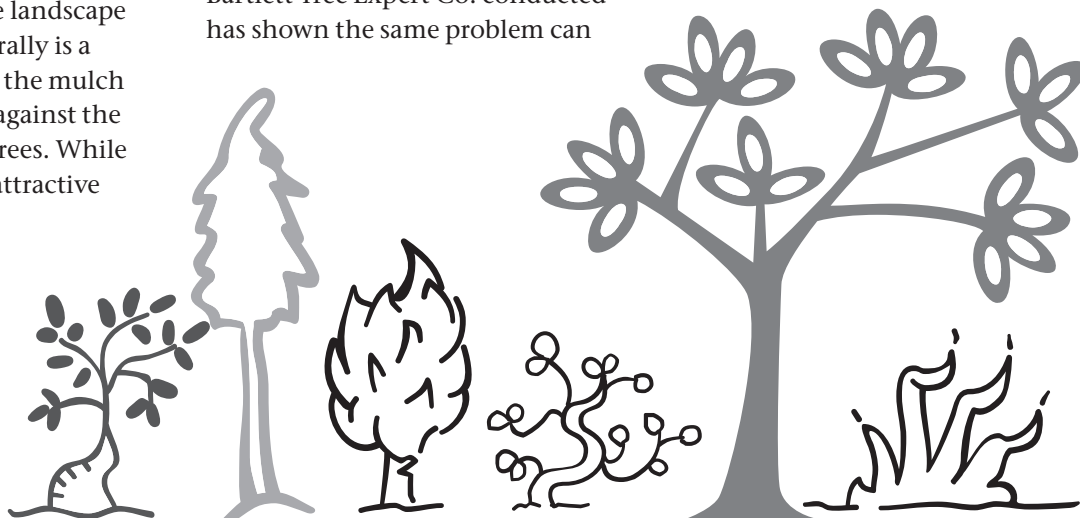
initially, mulch maintained in this manner in time will cause problems with disease and rodent damage over the contact area between the tree trunk and mulch. On younger trees, a mulch this thick could cause chlorotic foliage, crown die-back and reorientation of the original root system. Studies at the University of Minnesota have shown that in some cases, the original roots die out and the tree attempts to replace them along the trunk with adventitious roots (roots growing in an unusual or abnormal location). These are weak substitutes for the original root system, and almost always results in the decline and death of the tree during a period of years.

Unknown to most people and many professionals, bark on most woody plants needs to have a free gas exchange with the inner bark tissue known as the phloem. If a continuously moist mulch pressed against the bark restricts this exchange, the phloem may die. Since the plant needs phloem to transport photosynthates (starch and sugars) from the leaves to the roots, the roots can become malnourished, leading to eventual plant death. Research the Bartlett Tree Expert Co. conducted has shown the same problem can

occur from turfgrass irrigation systems that have sprinklers directly impacting the trunk with water, especially in the typically overirrigated situation of many home lawns.

Often gardeners and landscapers mulch as a reaction to damage from mowers and line trimmers. When they place the mulch against the trunk of the tree where such wounds exist without proper recovery, fungal and bacterial spores can enter from the moist mulch and thrive, causing decline and possible death of the host plant.

Leaves and grass clippings often are used as mulches. Leaves should be shredded before application to prevent matting. Grass clippings should be spread on a nonporous surface to allow drying before applying them as a mulch, keeping the application thickness limited to 1 inch. If the turfgrass has been receiving herbicide treatment, wait until the grass has been mowed at least three times before collecting it and using it for mulching purposes.

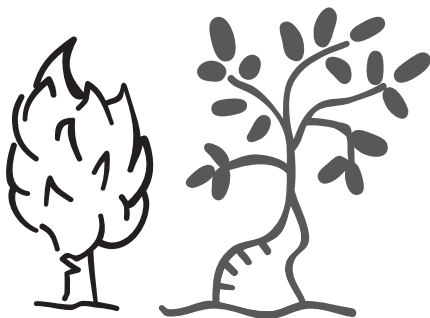


Soil Effects of Mulch

Where coniferous tree needles (pine, spruce and fir) have been collected and used for mulch continuously, the pH of the soil often is changed to a more acidic level. Sphagnum peat moss and pine bark, both used as a decorative mulch (pH 3.5–4.5), can have the same pH-lowering effect. Such acidification of otherwise alkaline soil may be beneficial for acid-loving plants such as azaleas and rhododendrons. At the very least, the pH may be lowered to the point where greater nutrient availability, especially the metallic ions of iron, copper and zinc, contributes to healthier and more productive plants. Research has shown the acidification is effective in the upper regions of the soil, but does not affect the subsurface soil because of the greater buffering capacity.

In gardens of annual flowers and vegetables, gardeners often spade the previous season's organic mulch into the soil before planting in the spring. This weathered mulch then acts as an excellent soil conditioner, improving the cation exchange capacity and providing macropores (needed for good drainage). It also becomes a bank for the slow-release of plant nutrients.

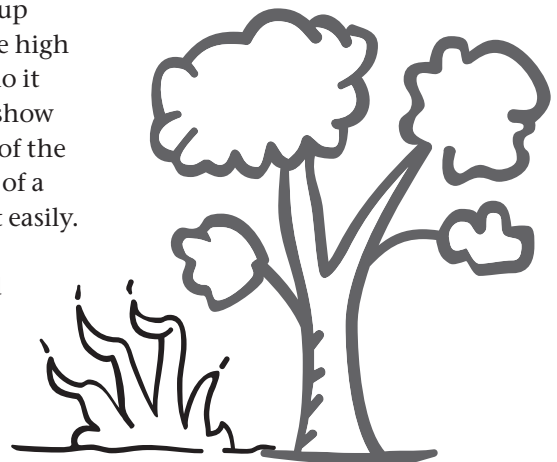
Gardeners and landscapers sometimes use limestone gravel mulches, but horticulturists do not recommend them for the following reasons:



1. The elevation of soil pH is significantly above neutrality (pH 7), often to the point of tying up of some of the metallic nutrient ions, notably iron.
2. The gravel tends to migrate somehow (wind, human activity, birds or pets). Something moves it off the target location into turf or sidewalk areas, where it can become a deadly missile or cause injury.
3. The reflective heat can elevate the temperatures in the immediate area to near lethal levels for the plant material. This is evidenced by a browning on the edges of the leaves.

Organic mulches modify soil temperature extremes. Many an experienced gardener has cleverly managed mulching practices to grow herbaceous plants out of their hardiness range. This requires the spreading of organic mulch over the crown and around the roots immediately after the soil has frozen or before winter hits. Excess mulch kept around a plant crown or against the stem of a tree can keep the plant from adequately hardening-off before winter closes in, resulting in possible premature death.

Freshly chipped, shredded or sawdust wood mulch can tie up nitrogen in the soil due to the high carbon-to-nitrogen (C:N) ratio it initially possesses. This may show up as chlorosis in the foliage of the plants, which an application of a nitrogen fertilizer can correct easily. With time, the C:N ratio gets closer (e.g., 18:1 or lower) and the nitrogen and other nutrients become available.



Some Precautions

Cocoa shell mulch has been used for more than 50 years as a landscape mulch. It comes in easy-to-handle 50-pound bags, spreads easily and has a pleasant cocoa aroma. Additionally, it lasts a long time as an organic mulch and does an excellent job of reducing weed pressure. The cocoa smell is attractive to dogs, but can be toxic when ingested in varying amounts. This toxicity has been verified in both the United Kingdom and U.S., according to the Veterinary Poison Information Service, with theobromine being identified as the toxicant. Using cocoa shells as a mulch should not be a problem where dogs are required to be leashed; gardeners and landscapers should consider another mulching product where dogs are allowed to roam uncontrolled.

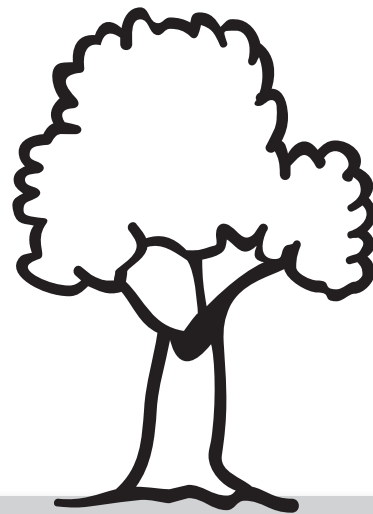
Black walnut (*Juglans nigra*) sometimes is included in freshly chipped material intended for mulch. The toxicant juglone is present in all parts of this tree species and may have an allelopathic effect on some desirable species of plants. See References for a listing of plants that the presence of black walnut mulch affects

negatively. Besides black walnut, other species have been reported to have suppressing or toxic effects (allelopathic) on certain woody plants. They include redwood bark (*Sequoia*), cedar (*Cedrus*), spruce (*Picea*), larch (*Larix*) and Douglas-fir (*Pseudotsuga*). These toxicities can be mitigated with proper mulching, and not overapplying, using on young plants or overwatering after applying. Given the option of choosing a coarse- or fine-textured material, opt for the coarse; it has less potential toxin. When in doubt, compost for a summer before applying.



Conclusion

Mulching is the natural recycling of materials when using organic sources. Properly applied and maintained mulches result in an aesthetically pleasing landscape planting, protect plants from the vagaries of nature and reduce pesticide inputs. Mulching is a basic feature of an IPM (Integrated Pest Management) program, which promotes a comprehensive understanding of microclimate landscape management.



References

IPM For Gardeners: A Guide to Integrated Pest Management; Cloyd, Nixon and Pataky. 2004, Timber Press. Pages 8,9; 102-103

Handbook for Integrated Pest Management for Turf and Ornamentals; Anne R. Leslie, Editor, 1994, CRC Press. Pages 26; 296-297

<http://ohioline.osu.edu/hyg-fact/1000/1148.html>; Ohio State University Fact Sheet; *Black Walnut Toxicity to Plants, Humans, and Horses*; HYG 1148-93, Richard C. Funt and Jane Martin, authors.

www.parkvets.com/clientinformation-cocoamulch.html; *Does Cocoa Mulch Poison Dogs?* Graham Peck, author; ParkVets Limited, 2003.

www.mnstac.org/STA/2003/MNSTAC_03_win.pdf; *Problems With Over-Mulching Trees and Shrubs*; Patrick Weicherding, author, UMN Regional Extension Educator

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