



*Wayne K. Clatterbuck  
Associate Professor  
Forestry, Wildlife & Fisheries*

## What Is Mulch?

A protective covering of various materials, either organic or inorganic, spread over the soil surface to reduce evaporation of moisture, improve plant growth, discourage weedy species and enhance the appearance of the landscape is known as mulch. **Inorganic** mulching materials include landscape fabric (geotextile) and plastic film that are primarily used for weed control and retention of soil moisture, while rocks, gravel, brick chips and shredded rubber are used more for decorative purposes. Most inorganic mulches do not decay and thus do not improve soil properties. Grass clippings, straw, pine needles, leaves, peat moss, compost, wood fiber and bark are **organic** mulches composed of decaying plant materials. Over time, organic mulches will decompose and become part of the soil, adding to the soil's organic matter, improving soil structure and nutrient availability and helping the soil retain moisture. However, as the organic mulches decompose, they must be replenished.

## Benefits of Mulch

Mulch has many benefits:

- Moderates the temperature of the root zone. Mulch provides an insulation effect, keeping the soil warmer during the winter and cooler during the summer.
- Encourages the conservation of moisture in the soil by reducing surface evaporation.
- Helps control weeds. A 2- to 4-inch layer of mulch reduces the germination and growth of weeds.
- Prevents the soil from crusting over, allowing water to penetrate and percolate. Mulch can improve soil aeration, soil structure (less soil compaction) and drainage.
- Adds organic matter to the soil, improving fertility.
- Restrains soil erosion, especially raindrop erosion.
- Reduces the chance of mechanical injury to trees and shrubs from lawn mowers and weed trimmers.
- Gives the landscape a more pleasing, manicured appearance.



Photo by Wayne Clatterbuck

Different types of mulches: (a) wood chips, (b) pine bark nuggets, (c) shredded hardwood bark and (d) brick chips.

## Improper Use of Mulch

Even with the many benefits of mulch, improper application can have a detrimental effect on trees. Most plants are sensitive to the depth of mulch. More than 4 inches of mulch restricts soil oxygen exchange with the roots. The effect is similar to planting trees deeper than they were grown in the nursery. Roots will have a tendency to grow upward into the mulch to gain better access to oxygen. Thus, instead of the roots spreading outward throughout the soil, they will congregate in the mulch. Excessive mulch can lead to accumulation

of moisture in the root zone, as well as moisture deficits during droughts, making roots more susceptible to rots, insects and disease.

A common practice in many landscapes is “volcano” mulching – the placing of mulch in a cone around and next to the trunk 8 to 12 inches high and extending horizontally about 2 feet in diameter. This depth of mulch restricts oxygen exchange with the roots, but also creates a moist environment at an elevated position near the base of the stem. This moist environment promotes cracking of the bark, creating an entry point for insects and fungal growth as well as conditions favorable for rodents to chew the bark and damage or girdle the tree.

Use of mulch that has not been properly composted or aged can create problems for many plants. Fresh grass clippings produce heat as they decay that may injure young plants. Other mulches, particularly fresh sawdust or wood wastes, do not contain adequate nitrogen for micro-organisms to decompose them. Decomposition of these mulches will remove nitrogen from the soil unless additional nitrogen is supplied, usually ½ to 1 pound of ammonium nitrate per 100 square feet of mulched area (Sams 1998). Mulch can also change the pH of the soil, influencing nutrient availability. Some materials, such as pine needles and oak leaves, are more acid, while grass clippings and hardwood bark are more alkaline. Anaerobic or “sour” mulch in materials that have not been properly composted have pungent odors that build from the production alcohols and organic acids. These compounds can be phytotoxic to young plants and should be avoided by using composted materials rather than fresh mulch.

### **Proper Use of Mulch**

Mulch should be applied in a ring at least 4 to 6 feet in diameter around the base of the tree. The depth of mulch should be no more than 2 to 4 inches, tapering out to the ground level at the edge of the ring. The farther out from the tree you can make the mulch ring, the greater benefit to the tree. The larger the area that is mulched, the less tree roots must compete with the lawn for water and nutrients. Roots usually extend well beyond the drip line of the tree crown. Do not pile mulch against tree trunks. Pull mulch several inches away from the trunk so that the base of the trunk is exposed and air moves freely.

### **Mulching Materials**

A great variety of both organic and inorganic mulching materials are available. The accompanying

table provides properties of common types of mulch. Other mulches, not listed in the table, might be available on a localized basis. Most of these materials are crop byproducts, such as rice hulls, cocoa bean hulls, peanut shells, pecan shells, ground or shredded corn-cobs and corn stalks, buckwheat hulls, cotton seed hulls and other cotton waste.

### **Summary**

Deciding which mulch is best for you will depend on your purpose, preferences and associated costs. Before choosing a mulch, consider how you will use it. Organic mulches are more natural and enhance many soil properties, while inorganic mulches are used more for decorative purposes. Both kinds of mulch conserve soil moisture to some extent and provide some weed control. All mulches have different properties that may be advantageous in some situations and detrimental in others. Make sure that mulch is applied correctly to enhance tree growth and that cured or aged materials are used.

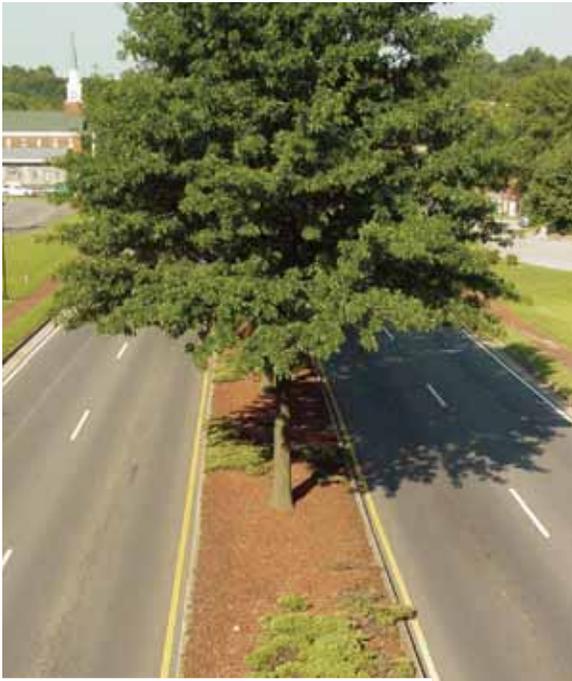
### **References**

- Crater, D. 1999. Landscape mulching materials. The University of Tennessee Agricultural Extension Service Publication PB 713. Knoxville. 11 p.
- International Society of Arboriculture (ISA). 2002. Proper mulching techniques. Champaign, IL. 3 p.
- Relf, D. 2001. Mulching for a healthy landscape. Virginia Cooperative Extension Publication 426-724, Virginia Tech University, Blacksburg. 4 p.
- Samples, T and M.A. Nash. 2001. Composting yard, garden and food wastes at home. The University of Tennessee Agricultural Extension Service Publication PB 1479. Knoxville. 8 p.
- Sams, D.W. 1998. Mulching vegetable gardens. The University of Tennessee Agricultural Extension Service Publication SP 291-H. Knoxville. 2 p.
- Starbuck, C.J. 1998. Mulches. University of Missouri-Columbia Agricultural Publication G06960. 10 p.

Properties of Common Organic and Inorganic Mulches						
Material	Resistance to Compaction	Attractiveness	Resistance to Wind	Availability	Source of Weeds & Disease	Comments
<b>Organic</b>						
Grass Clippings	C	C	B	A	C	Fresh clippings may heat up during decomposition, injuring young plants; may harbor weed seeds.
Sawdust	C	C	B	B	A	Adds nitrogen; use well-aged material; has a tendency to cake, affecting water absorption.
Straw	B	C	B	B	C	Often contains weed and grain seed.
Compost	B	B	A	A	C	A good mulch. Refer to UT Extension Publication PB 1479 (Samples and Nash 2001); high in nutrients & organic matter.
Bark Chips	A	A	A	A	A	Inexpensive; plentiful from wood wastes; does not decay quickly.
Wood Chips	A	B	A	B	A	Same as bark chips; use aged material if possible.
Peat Moss	B	A	A	A	B	Increases organic matter & water-holding capacity of the soil.
Manure	B	B	A	C	C	Should be well-rotted or pungent odors can occur; may harbor weed seeds.
Paper	C	C	C	A	A	Must be shredded; not attractive; inexpensive; easily mats.
Shredded Bark	B	A	A	A	A	One of the best materials; low maintenance; inexpensive; readily available; decays quickly.
Pine Straw	A	B	B	C	B	Good for acid-loving plants; decomposes slowly.
Leaves	C	B	C	A	B	Compost first; thick layers of leaves can obstruct water absorption.
Wood Shavings	B	B	B	C	A	Nitrogen fertilizer should be added; tendency to mat.
<b>Inorganic</b>						
Plastic Film	C	C	C	A	A	Good for weed control; must anchor or hold in place by covering with a more decorative mulching material; easily torn; high soil moisture commonly results in root rots.
Geotextile	A	C	C	A	A	Must anchor; usually covered with other mulch; used primarily for weed suppression.
Solid Rock	A	B	A	A	A	Pea gravel or river rock and boulders used primarily for decoration over a sheet of plastic film.
Crushed Rock or Gravel	A	B	A	A	A	Stay away from limestone, as it may make the soil more alkaline (higher pH).
Brick Chips	A	B	A	B	A	Decorative with many colors; used in conjunction with a sheet of plastic film.
Shredded Rubber	B	B	A	C	A	Resists decomposition; stable; leaching of zinc can be toxic to plants; conserves soil moisture.

A = Good, B = Moderate, C = Poor

Table adapted from University of Missouri-Columbia Agricultural Publication G06960 and University of Tennessee Agricultural Extension Service Publication PB713



Crushed brick is an inorganic mulch that is decorative and long-lasting, being used on the median of a roadway.

Photo by Wayne Clatterbuck



Mulch should not be more than 3 to 4 inches deep. In this example, the mulch is much too deep, about 18 inches.



“Volcano” mulching can have a harmful effect on plant roots and the trunk of the tree.



Mulch provides definition to a well-manicured and attractive landscape. Note that the mulched area extends beyond the trunk of the tree.

SP617-12M-7/03 R12-4910-034-008-04

The Agricultural Extension Service offers its programs to all eligible persons regardless of race, religion, color, national origin, sex, age, disability or veteran status and is an Equal Opportunity Employer. COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

The University of Tennessee Institute of Agriculture, U.S. Department of Agriculture, and county governments cooperating in furtherance of Acts of May 8 and June 30, 1914.

Agricultural Extension Service  
Charles L. Norman, Dean

Printing for this publication was funded by the USDA Forest Service through a grant with the Tennessee Department of Agriculture, Division of Forestry. The Trees for Tennessee Landscapes series is sponsored by the Tennessee Urban Forestry Council.

