

Mulches are widely used in urban landscapes for their many benefits, which include:

- weed suppression,
- soil temperature stabilization,
- Soil moisture conservation,
- reduced soil compaction,
- increased moisture infiltration,
- decreased injury to trees and shrubs, and
- reduced soil erosion from lawn mowers and string trimmers.

Mulches also enhance the appearance of landscapes and gardens and assist plants in establishing.

Mulch Types

Mulches may be organic or inorganic. Organic mulches are derived from a variety of materials including tree bark, wood chips, recycled wood and paper, grass clippings, pine needles, straw, sawdust, leaf litter, and animal manure. Typical organic mulches include hardwood bark, cypress bark, pine bark, and pine straw. Organic mulches restore beneficial soil nutrients and should be replaced periodically.

Inorganic mulches are derived from nonliving sources including crushed stone, gravel, landscape fabric, plastic sheeting, and recycled tire chips. Inorganic mulches do not need to be replenished because they do not decompose or contribute organic matter to the soil.

Recommended depth for organic mulches is 2 to 3 inches. Too much mulch may decrease air circulation, result in water-logging during rains, encourage root rot diseases, and provide winter shelter for hibernating insects and chewing rodents such as mice and voles. Mulch texture and depth may influence the abundance and types of arthropods (insects and mites and/or invertebrates) that reside in organic and inorganic mulches.

Mulches and Arthropods/Invertebrates

Mulches provide arthropods (insects and their relatives) and/or invertebrates with food, shelter, and moisture needed for survival. Fungi, algae or bacteria that proliferate in mulch, including bagged mulch sold in garden centers or nurseries, serve as an additional food source for many invertebrates.

Applying organic or inorganic mulches to landscapes, particularly near home foundations, may attract nuisance and/or structural arthropod pests such as centipedes, millipedes, earwigs, ants, and termites. Arthropods or other

invertebrates may seek out more favorable conditions in homes when outdoor temperature and moisture conditions become less hospitable.

Feeding by carpenter ants or termites may damage wooden structures. Ants, for example, may nest in organic landscaping mulches such as pine straw, pine bark, cypress bark, and hardwoods, which are typically placed near building foundations. This may expedite entry to buildings and increase the need to apply insecticides to prevent ants from entering homes. On the other hand, use of mulches can increase populations of spiders and predatory ants, thereby reducing problems associated with certain arthropod pests.

Millipedes are one of the predominant arthropod groups present in mulches. Others include centipedes, isopods (pillbugs and sowbugs), earwigs, spiders, ants, and beetles. In fact, 60 percent of invertebrates present in mulches are saprophytes that feed on decaying or dead organic matter and fungi.

Of the common mulch types, pea gravel has been shown to have the fewest total number of invertebrates. The highest invertebrate numbers were present in organic mulches containing hardwood and/or recycled wood. Predatory arthropods and invertebrates including ants, centipedes, spiders, rove beetles, and ground beetles also are common in mulches. This is likely due to the abundance of small invertebrates such as springtails, which feed on microbes that decompose mulch and provide food for large predatory invertebrates.

Invertebrates quickly establish in new mulches likely because bacteria and fungi accumulate in bagged (sealed) mulch before it is applied to landscapes. Applying mulch inoculates landscapes with microorganisms, which serve as a food source for a diversity of invertebrates.

Not all organic mulches are conducive for arthropod and/or invertebrate establishment. For example, both the Argentine ant (*Linepithema humile*) and odorous house ant (*Tapinoma sessile*) tend to avoid aromatic cedar mulches for nesting. In fact, prolonged exposure to aromatic cedar mulch is detrimental to Argentine ants. Additionally, mulches containing *Melaleuca* spp. (honey myrtle) are not consumed by populations of the subterranean termite (*Reticulitermes flavipes*), possibly due to repellent or toxic properties of melaleuca wood.

Mulches and Termites

Inorganic mulches, in general, are supposedly less attractive to termites. Organic mulches, conversely, may be more attractive to foraging termites because of favorable



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temperatures and moisture conditions created beneath the underlying soil. Decay fungi also may contribute to termite activity by enhancing wood decomposition, which makes wood more digestible. Moisture underneath wood mulches may lure termites to residential structures and encourage foraging or consumption. Termites foraging in mulch on top of treated soil may use mulch as a bridge across soil termiticide barrier treatments to reach the foundation. This is a concern because termites, particularly subterranean termites, cause approximately \$5 billion in structural damage annually in the United States.

Initially, there was concern that the movement of mulch from New Orleans, La. after Hurricane Katrina in 2006 was contaminated with Formosan termite, *Coptotermes formosanus*, the most destructive termite species infesting structures in the United States. This is not true because the Louisiana Department of Agriculture and Forestry placed quarantines on parishes devastated by the hurricane, preventing movement of wood or cellulose materials. It is doubtful that Formosan and other termite species could survive the mulching process, which includes shredding, packaging, and transportation. Introducing termites into a site with infested mulch is unlikely because reproductive queen termites that are responsible for establishing new colonies live only in the soil and are not present in mulch.

Mulches may be nutritionally inadequate to support termite populations. For example, bark mulches, which contain indigestible lignin, may be an insufficient food source for termites. Mulches, including gravel, may increase

termite problems primarily because of their moisture retention and temperature buffering characteristics. In fact, gravel mulches have been shown to be more attractive than pine bark, hardwood, and eucalyptus. The subterranean termite has been reported to consume pine sapwood and cypress sapwood mulches.

Mulch decomposition rates vary depending on type, moisture, and placement in landscapes. Mulches that decompose rapidly are consumed more readily by termites. Both temperature and moisture are important in influencing termite activity in mulches.

Minimizing Living Organisms

Here are some mulch application tips to avoid problems with arthropods and/or other invertebrates:

- Use no more than a 2- to 3-inch mulch depth.
- Disturb mulch routinely, which reduces the ability of arthropods and/or other invertebrates to establish.
- Keep mulches at least 6 inches away from building foundations. This minimizes the abundance of occasional invaders and allows termite inspectors to see the bare concrete foundation at ground level to facilitate observation of termite tubes.
- Use inorganic mulches near foundations with the possible exception of gravel.



Keep mulches 2 to 3 inches away from the base of trees or shrubs.

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