Woodchip Mulches for Landscape Trees

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Exposed to increasingly hot, dry summers, landscape trees suffer from chronic environmental stresses associated with reduced water availability. Properly chosen and applied mulch will help moderate tree stress by improving soil conditions and protecting root health. Not all mulches are appropriate for permanent landscapes, however, and poorly chosen mulches can damage soil health and increase stress to trees. Woodchip mulches have been shown to provide the greatest benefits to landscape trees, so the primary focus of this TIS is to promote the use of arborist woodchips and dispel unfounded concerns.

ALL MULCHES ARE NOT CREATED EQUAL

A mulch is any material laid on top of the soil, as opposed to being worked into the soil (amended). While soil amendment is common in agricultural crop production, it is not appropriate for trees and other woody species that have evolved under different conditions. In a forest environment, organic material accumulates on top of the soil and is worked in slowly by rainfall, gravity, and the activity of soil dwelling organisms.

We can categorize mulches as living, synthetic, inorganic, or organic; detailed descriptions of these categories can be found elsewhere (Chalker-Scott, 2007; Chalker-Scott and Downer, 2022). Below is a brief comparison of relative benefits and drawbacks of these mulch categories (Table 1).

***Table 1*. Impacts of landscape mulches compared to bare urban soils (ratings based on Chalker-Scott, 2007).**

	Living	Synthetic	Inorganic	Organic
Retain soil moisture	+/0/-	-	+	+
Reduce compaction	+	+/0	+	+
Moderate soil temperature	+	+/0/-	+/0/-	+
Enhance soil nutrients	+/-	-	0	+/0
Enhance plant growth	+/0/-	0/-	+	+
Enhance soil life	+	-	+	+
Increase weed control	+	-	+/-	+
Increase pest insect control	+/0	0/-	+/0	+/0
Increase disease control	+/0	0/-	+/0	+/0
Reduce need for pesticides	+	-	+/-	+
Cost	$	$$ to $$$	$ to $$$	0 to $$
Availability	N/LC	N/LC, HI	N/LC, HI	N/LC, HI, A/U/TS
Ease of replacement	Moderate	Difficult	Easy	Easy

Key to symbols:

+ = positive impact
0 = no net impact
- = negative impact

$ = low
$$ = moderate
$$$ = high

N/LC = nursery/landscape center
HI = home improvement store
A/U/TS = arborist/utilities/tree service

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DO NOT USE SHEET MULCHES OR FINELY TEXTURED MULCHES

It is important not to succumb to popular claims that landscape fabric, plastic, cardboard, or other two-dimensional materials are good for weed control. Not only do these materials not control weeds, but they also interfere with water and gas movement between the soil and the atmosphere. In fact, a single sheet of landscape fabric or black plastic reduces gas movement by factors of 100 and 1000, respectively, compared to 4" of arborist woodchips (Figure 1; Shahzad et al., 2019). This interference harms both soil organisms and roots. Likewise, finely textured mulches such as compost and sawdust cannot be applied in deep layers as they too will limit gas and water exchange.

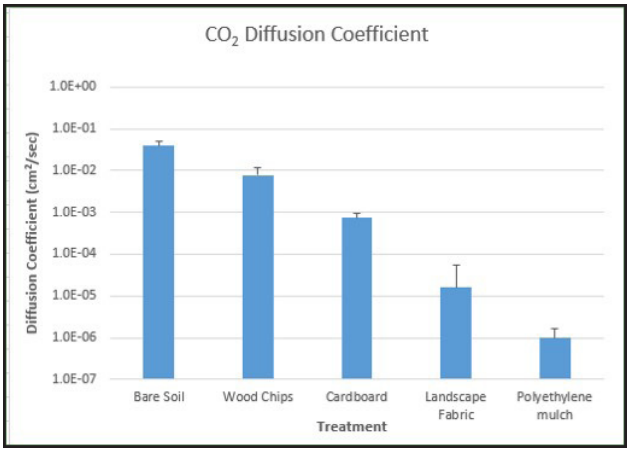

***Figure 1*. Comparative CO2 diffusion coefficients for different mulch materials. Derived by Linda Chalker-Scott from data in Shahzad et al., 2019.**

INORGANIC MULCHES (INCLUDING COBBLES, GRAVEL, DECOMPOSED GRANITE)

While stone mulches are often desirable in xeric environments, which naturally contain little organic material, they are not optimal for trees that have evolved in less arid environments. Trees that have forest origins need to be surrounded by woody mulch to mimic their natural habitat, particularly in providing resources for mycorrhizae. Both stone and woodchip mulch can benefit trees in arid urban settings, but only woodchip mulch can provide organic matter and nutrients, improve soil moisture, and stimulate soil activity (Frene et al., 2026).

BENEFITS OF WOODCHIP MULCHES

By nearly every measure, woodchip mulches – particularly arborist woodchip mulches – benefit soils and plants. While these benefits have been described elsewhere (Chalker-Scott and Downer, 2022), they are worth summarizing here.

- Retain water, reduce runoff and evaporative loss (meaning less time needed for irrigation)
- Reduce compaction
- Moderate soil temperatures
- Provide a slow feed of macro- and micronutrients as they decompose
- Increase root formation under mulches, thus enhancing plant establishment and growth
- Provide habitat and a carbon source for mycorrhizal fungi and other beneficial microbes
- Reduce the likelihood of disease organisms to become virulent, especially root pathogens
- Provide habitat for beneficial arthropods which can help manage pests
- Suppress weeds
- Reduce the need for pesticides and fertilizers.

There are other woodchip mulches (e.g., hog fuel, playground chips, recycled woodchips) available at garden centers and other retail sites. But research strongly suggests that arborist woodchip mulches provide more benefits and fewer drawbacks than any of the other mulch choices (Chalker-Scott, 2007). Arborist chips contain foliage, moist wood, and a variety of beneficial microbes, all of which contribute immediately to the soil ecosystem. Arborist woodchips are available from tree services, where tree prunings and removals are immediately fed through the chipper (Figure 2).

***Figure 2*. Arborist woodchip delivery from a local tree service. *Photo courtesy of Dr. Linda Chalker-Scott*.**

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WOODCHIP MULCH MYTHS

We have previously addressed many common myths about the use of woodchips as a landscape mulch (Chalker-Scott and Downer, 2022, 2018). As these have been discussed in detail elsewhere, they are simply summarized below (Table 2).

***Table 2*. Common misperceptions about wood-based landscape mulches.**

Myth	Fact	Reference
Woodchips deplete soil nitrogen.	As long as mulches stay on the soil surface they do not significantly change nitrogen levels in the underlying soil.	Chalker-Scott and Downer, 2018
Chips made of diseased wood will spread disease to healthy plants if used as a mulch.	Woodchips do not contain active pathogens and are heavily colonized with beneficial microbial flora (Figure 3).	Chalker-Scott and Downer, 2018
Woody mulches acidify the soil.	An acidic mulch does not change the pH of the underlying soil.	Chalker-Scott and Downer, 2022
Deep woodchip mulches injure trees.	Woodchips are coarse and do not significantly interfere with water and gas movement (Figure 4). Trees that are surrounded by deep layers of woodchips have superior establishment, growth, and survival compared to those with shallow or absent mulch layers (Figures 5-6).	Chalker-Scott and Downer, 2022
Woody mulches attract pests.	Woodchips do not support survival of disease organisms, weeds, or insect pests.	Chalker-Scott and Downer, 2022
Woodchip mulches are flammable.	Woodchip mulches are water-absorbing materials that house mycorrhizae and other fungi. They are among the least flammable of all organic mulches (Figures 7). In contrast, bark mulch is easily ignited (Figure 8), thanks to high levels of waxes and other flammable phytochemicals.	Chalker-Scott and Downer, 2022 Quarles and Smith, 2011

***Figure 3*. Research on buried inoculum studies shows that pathogens are poor survivors in fresh woodchip mulches. *Photo courtesy of Dr. James Downer*.**

***Figure 4*. Wounded maple trees (top) were covered with AWC mulch (center) or left exposed (bottom). No disease was found on any of the trees studied. However, wound closure was generally enhanced when covered with arborist woodchips (Giblin, 2021). *Photos courtesy of Dr. Jeff Gillman*.**

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Figure 5. Freshly installed woodchip mulches at different depths during field research. A single tree is in the center of each plot. *Photo courtesy of Dr. Eric Eulenberg*.

Figure 6. One year after mulch installation, weeds have covered the area except where woodchips are the deepest (8-12 inches). *Photo courtesy of Dr. Eric Eulenberg*.

Figure 7. Arborist woodchips do not easily burn even when subjected to direct flames (left); charring is the only result (right). *Photos courtesy of Dr. James Downer*.

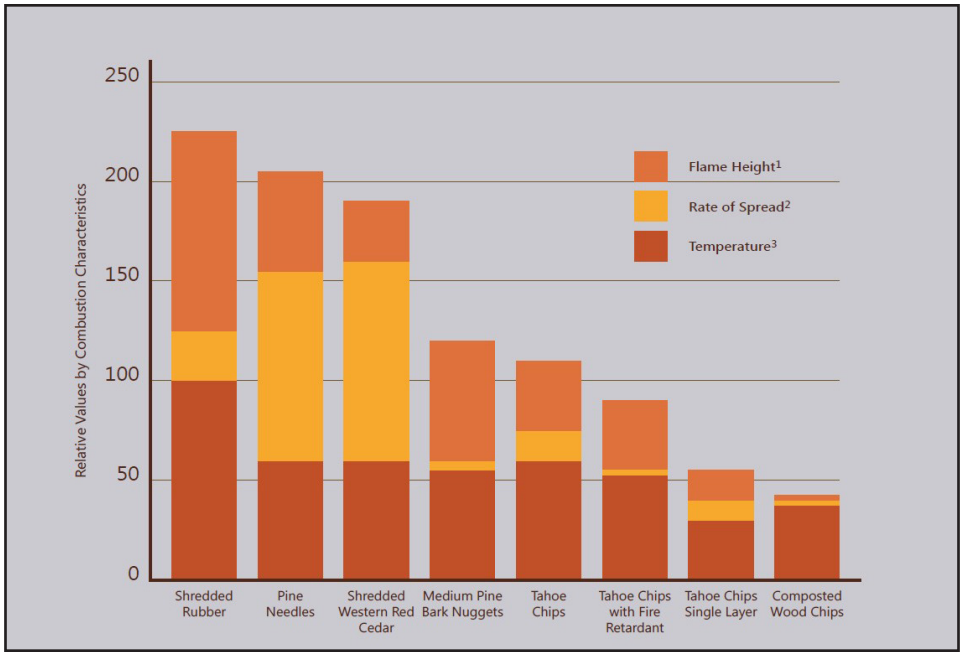

Figure 8. Comparative mulch flammability (Quarles and Smith, 2011).

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HOW TO APPLY WOODCHIP MULCHES IN THE LANDSCAPE

The last few decades of research on landscape mulches and tree health have provided consistent and reliable data from which arborists can draw practical guidance. Given the superior performance of woodchip mulches in treed landscapes, our application recommendations are as follows:

- Apply mulches at least 4 inches thick to derive maximum mulch benefits
- Reapply fresh mulch at least once per year, or as depth decreases below 4 inches (shallower layers will promote weed growth)
- If possible, use fresh arborist woodchips
- Do not use any sheet mulches under woodchips; they interfere with soil and root health
- Do not apply fertilizers over mulches; a soil test should be performed to determine whether nutrient deficiencies are present before routine application of fertilizer.

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