

Mulches: The Good, the bad, and the really, really ugly

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Seminar recommendations

- 🌱 Apply to most ornamental gardens and landscapes
- 🌱 Are based on appropriate, current plant and soil science

Unmanaged urban soils ...

- 🌱 are heavily compacted: poor water and air movement
- 🌱 have abrupt layers
- 🌱 often have low organic matter
- 🌱 need to be tested before selecting plants or adding amendments

Compaction

- 🌱 Created by vehicles, people & animals
- 🌱 Reduces water and air movement, and therefore root movement

An ideal landscape mulch will...

- | | |
|--|---|
| 🌱 Enhance water infiltration and retention | Enhance gas transfer |
| 🌱 Moderate soil temperatures | Reduce erosion and compaction |
| 🌱 Improve soil structure | Provide mineral nutrients |
| 🌱 Neutralize pollutants | Enhance beneficial microbes and insects |
| 🌱 Suppress pathogens and pests | Be cheap, easy to find, and easy to apply |
| 🌱 Not detract from aesthetics of landscape | |

Impacts of landscape mulches compared to bare urban soils

	<u>Living</u>	<u>Synthetic</u>	<u>Inorganic</u>	<u>Organic</u>
Soil moisture?	+/0/-	-	+	+
Reduce compaction?	+	+/0	+	+
Moderate temperature?	+	+/0/-	+/0/-	+
Provide nutrients?	+/-	-	0	+/0
Enhance plant growth?	+/0/-	0/-	+	+
Enhance beneficials?	+	-	+	+
Control weeds?	+	-	+/-	+
Control pest insects?	+/0	0/-	+/0	+/0
Control disease?	+/0	0/-	+/0	+/0
Reduce pesticide use?	+	-	+/-	+
Cost?	\$	\$\$ to \$\$\$	\$ to \$\$\$	Free to \$\$
Availability?	N/LC	N/LC, HI	N/LC, HI	N/LC, HI, A/U/TS
Ease of replacement?	Moderate	Difficult	Easy	Easy

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

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

Mulches

- 🌱 Living: Cover crops, ground covers
- 🌱 Synthetic: Geotextiles, plastics, rubber
- 🌱 Inorganic: Brick, decomposed granite, lava rock, stone pavers, tumbled glass
- 🌱 Organic: Bark, coir, compost, leaves, nutshells, pine needles, straw, wood chips

Synthetic mulches

- 🌱 Not a permanent solution to weed control
- 🌱 Can damage health of landscape system
- 🌱 Sheet mulches reduce water and gas transport
- 🌱 Rubber mulches are flammable and may leach harmful chemicals
- 🌱 Best used for crop production or where no plant material is desired

Problems with cardboard & newspaper sheet mulches

- 🌱 Can induce anaerobic conditions if used on wet, poorly drained soils
- 🌱 Will become hydrophobic if allowed to dry out
- 🌱 Can become pest havens for termites and rodents

Effectiveness of inorganic and organic mulches - numerous studies

- 🌱 Weed control improves with mulch depth
- 🌱 Permeability increases with mulch coarseness
- 🌱 Greatest benefits and fewest drawbacks with deep, coarse mulches

Decomposition of organic mulches dependent on environment

- 🌱 Moisture (more moisture = faster decomposition)
- 🌱 Temperature (warmer temperature = faster decomposition)
- 🌱 Soil microbe population (diverse population = faster decomposition)

Decomposition of organic mulches dependent on C:N ratio

- 🌱 Grass clippings, leaves, manures: Rapid (days to weeks)
- 🌱 Composts: Moderate (about six months)
- 🌱 Wood chips, hardwood bark, peat: Slow (up to several years)
- 🌱 High cellulose and phenolic content will decrease decomposition rate
- 🌱 Replacement rate depends on decomposition rate

Organic mulches can...

- 🌱 provide a slow release of macro- and micro-nutrients
- 🌱 improve soil structure by reducing compaction
- 🌱 enhance establishment of trees and shrubs in low-maintenance landscapes
- 🌱 enhance beneficial microbes, which can outcompete many pathogens in healthy soils
- 🌱 enhance soil macrofauna biodiversity

Basic comparisons between inorganic and organic mulches

Inorganic:

- 🌱 Good choice for regions where water is limited and organic matter is naturally low
- 🌱 Low replacement rate, but also does not contribute nutrients to the soil

Organic:

- 🌱 Good choice for regions where water availability ensures optimal OM level (5-10%)
- 🌱 Decomposition requires continual replacement

Problems with fine-textured mulches

- 🌱 Includes sawdust and some composts
- 🌱 Deep applications will lead to anaerobic soil conditions
- 🌱 Often become compacted into impervious layers

Problems with compost

- 🌱 Possibility of toxic plant materials or byproducts
- 🌱 If too much of a nutrient source is added to a landscape, excess nutrients contaminate watersheds. Phosphate in particular requires monitoring.
- 🌱 Contamination with broadleaf herbicides can injure or kill ornamentals
- 🌱 Unregulated compost can contain pesticides, heavy metals, and other toxins that may be harmful to you and your plants (e.g. mercury accumulations in golf course turf)

Using compost as a mulch

- 🌱 Choose those that have been analyzed and certified, or that you make yourself with contaminant-free materials
- 🌱 Use thin layers to reduce problems associated with fine-textured mulches and with nutrient overload
- 🌱 Cover the compost layer with a coarser organic mulch to prevent erosion and weed establishment (the “mulch sandwich”)

Problems with coarse woody mulches

Bark mulches

- 🌱 Bark mulch can be contaminated with salt or weed seeds
- 🌱 Bark contains waxes that prevent absorption and release of water in landscapes
- 🌱 Softwood bark mulches are often not “people friendly” due to tiny, sharp fibers

Arborist wood chips

- 🌱 Concerns about high carbon:nitrogen ratio - will this cause a nitrogen deficiency?
- 🌱 Will diseased wood transfer pathogens if it is used for chips?

Nitrogen availability

- 🌱 Wood chip mulches have a high C:N ratio, leading to a localized nitrogen deficiency at the mulch-soil interface
- 🌱 Wood chip mulches do not cause nitrogen deficiency in established plants
- 🌱 High C:N ratio in wood chips probably prevents germination of some weed seeds

Fungal pathogens and wood chips

- 🌱 *Armillaria*, *Cytospora*, *Thyronectria* and *Verticillium* can all survive on large wood segments for months
- 🌱 Survival is enhanced if wood chips are incorporated into soil
- 🌱 No evidence that pathogens in mulch can infect roots below the soil surface

Fungal communities in wood chips

- 🌱 Fungal species in wood chips are generally decomposers, not pathogens
- 🌱 In healthy (aerobic) soils, beneficial fungi probably out-compete pathogenic fungi
- 🌱 Healthy plants are not susceptible to opportunistic pathogens

Wood chip mulches for landscapes
Weed suppression by wood chips

- 🌱 Highly effective - better than herbicides
- 🌱 Cost-effective - low to no cost materials

How do wood chips inhibit weeds?

- 🌱 Inhibit weeds through allelopathic chemicals
- 🌱 Decrease nitrogen levels at soil interface
- 🌱 Reduce light needed by photodormant seeds
- 🌱 Reduce light availability to buried leaves
- 🌱 Depth is critical - less than 3" and weed increase

Mulch strategies using coarse organic materials

- 🌱 Fresh wood chips have the highest nutrient content
- 🌱 Begin mulch application before annual weeds are established (spring or fall)
- 🌱 Remove perennial weeds in early spring when root resources are lowest
- 🌱 Prune or mow perennial weeds at root crown; pulling destroys soil structure
- 🌱 Remove all noxious weed materials from site to prevent rerooting
- 🌱 Thick layers (6-8" for ornamental sites, 8-12" for restoration sites and blackberry/ivy control) of coarse materials are best for weed control and water conservation
- 🌱 Keep mulch away from trunks of trees and shrubs
- 🌱 Pull any resprouting plants; the mulch layer prevents erosion and facilitates pulling
- 🌱 Replace mulch as needed to maintain appropriate depth (minimum depth of 4 inches for weed control). This depends on decomposition rate

Mulch review article

Chalker-Scott, L. 2007. Impact of mulches on landscape plants and the environment - a review.
Journal of Environmental Horticulture 25(4):239-249.

Fact sheets

Dust mulches: <http://cru.cahe.wsu.edu/CEPublications/FS167E/FS167E.pdf>

Rubber mulches: <http://cru.cahe.wsu.edu/CEPublications/FS163E/FS163E.pdf>

Wood chip mulches: <http://cru.cahe.wsu.edu/CEPublications/FS160E/FS160E.pdf>

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