

Carbon Gardening (Part 2): Sequestering Carbon with Mulch

by Will Bakx, Soil Scientist

Mulches are often overlooked in relationship to sequestering carbon. However, they play an important role in the soil's ability to store atmospheric carbon as organic matter. Both organic as well as inorganic (gravel, volcanic rock, etc.) mulches are widely used in landscaping. Only organic mulches sequester carbon; inorganic mulches tend to deplete soil carbon over time. For that reason, it is recommended that landscapers select organic mulches derived from trees, shrubs, or yard debris.

Mulches can sequester carbon in two ways. Although a single application of mulch will break down in 2 to 5 years, if a 2 to 3-inch layer of mulch is maintained continuously, it creates an organic layer that effectively sequesters carbon. Mulches also improve soil fertility and water holding capacity, leading to improved plant growth, which in turn increases soil organic carbon that will remain locked in the soil for decades, if not hundreds of years. Let's take a closer look at this process.

Mulch is a protective blanket for the soil

Mulch acts as a high-carbon, protective blanket that stores organic matter and reduces erosion.

Fungi use carbon as an energy source, but mulch lacks the nutrients fungi need to build their cell walls. Hence, fungal hyphae enter the soil in search of nutrients. This improves soil structure through enhancement of soil aggregation, which mainly takes place around the plant root zone — the rhizosphere — where plants exude more than 40% of the carbon taken from the atmosphere. Not only do the hyphae help stabilize soil organic matter but as the soil around the plant root zone becomes better aggregated, plants can expand their root zones — and associated fungal hyphae and the carbon embodied in those structures — more extensively in the soil.



Mulching is natural

Carbon gardening is most successful with low- or no-till practices. In a new or depleted landscape, it is best to start by working in an application of compost and other amendments as needed. After that, mulching is a good practice to further enhance carbon sequestration.

Choosing the right mulch

Not all organic mulches behave the same way. When selecting a mulch, it's important to consider how the area will be used. For heavily trafficked pathways, an inorganic mulch may be most appropriate or a mulch that is coarse and very woody, such as chips from trees. This will

help maintain a softer, aggregated soil under the mulch layer, allowing roots from nearby plants to expand and take advantage of favorable soil conditions under the mulched pathway. Remember, organic path mulch needs to be replenished frequently to maintain its soil protection and enhancement function. Where the goal is to smother weeds while maximizing organic matter in the soil, a mulch in the process of decomposition is best. This could be a composted mulch derived from yard debris or a composted blend of manure, shavings, or nut shells. The composted mulch remains on the soil, and a new layer of mulch can be placed right on top of the old mulch every few months, or annually, as needed. Make sure to select a mulch with the texture, odor, and visual characteristics you are looking for.

Composting of yard debris and manures is important to prevent the spread of weed seeds and diseases. “Composted mulch” need not be fully composted. But to ensure the mulch is weed and disease free, it should reach temperatures >131°F for at least 15 days, during which time the mulch must be turned at least 5 times for turned windrows or >131°F for 3 days in a covered aerated static pile compost system.

Mulches also help reduce greenhouse gas (GHG) emission from soils, which, along with carbon sequestration, is essential to reducing GHG in the atmosphere. A mulch blanket conserves soil water, which means that we need to pump and use less water. At the same time, this blanket of organic material suppresses weeds, which means fewer petrochemical herbicides, particularly with the sustained use of mulches over time, as new weed seeds are not brought to the surface through tillage.

[Will Bakx](#) is a soil scientist, soil health consultant and compost expert based in Sonoma County. He is co-owner of [Sonoma Compost Co.](#) and [Renewable Sonoma](#) and is committed to bringing back high-quality, affordable compost to the community. He currently works as general manager for [West Marin Compost](#) in Nicasio, CA.