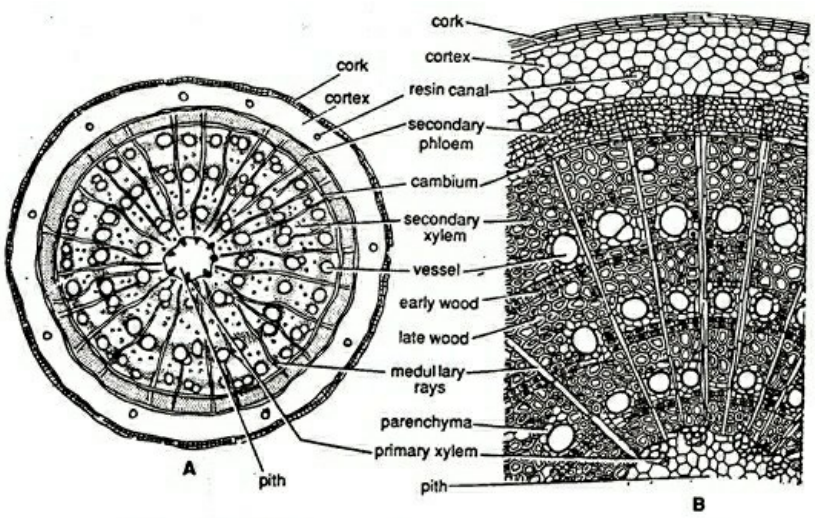
Conservation Practice Fact Sheet

Using Biochar as a Soil Amendment

Biochar is a modern technology that returns carbon to the soil in the form of long-lasting charcoal. It's made by baking/burning biomass (such as wood, plant matter, manure, and other organic materials) without the oxygen that could cause it to burn completely to ash. This process, burning in the absence of oxygen, is called **Pyrolysis**.

While commercially produced biochar has very consistent qualities due to strict process controls, biochar created using Carlton SWCD's Oregon Kiln is often less uniform because it is produced in an environment with more variables (e.g. temperature fluctuations, input variations). However, Carlton SWCD can make basic soil amendment recommendations based on extensive lab analysis on several batches of biochar we have produced. Testing your soil to see what your soil needs, and testing your biochar to see what soil amendment qualities your biochar has, is always recommended.

Wood has many cellular vessels used to transport nutrients and water from the soil to the leaves of a tree or shrub (see diagram below). The process of pyrolysis vaporizes most of the nutrients and water these cellular vessels contain, but the structural integrity of these cellular vessels is maintained after pyrolysis and we refer to these spaces as **micropores or pore spaces**.



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Depending on the biomass you choose to turn into biochar, the finished product may look different in terms of particle size. Biochar is brittle, so the particle size be reduced by crushing it to a size more conducive to working into soil as a soil amendment.

Picture at left is biochar produced from brush size biomass.

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The soil health benefits of using biochar are widely accepted and supported by agricultural professionals in the region, throughout the US, and around the world.

By itself biochar is nominally valuable as a soil additive due the absence of nutrients in biochar alone. Where biochar really shines is its ability to "hold" onto nutrients, water, beneficial soil microbes and bacteria within the porous structures. **We recommend mixing the biochar with livestock manure or compost and letting the mix rest for two weeks before applying it as a soil amendment.** This mixing "charges" the chunks of biochar with nutrients and microorganisms from the compost or manure, as these microorganisms and beneficial bacteria are the key to building a healthy soil.

The key role of biochar is holding soil building components until plants want them. This picture (left) shows plant roots growing through a piece of biochar. A variety of biochar size is okay within reason, as size variation allows access at different levels by root growth.

As a general rule, a 5 gallon bucket of dry biochar weighs about 8 lbs.

Below are the best practices and rates recommended for biochar use by the Carlton SWCD.

Type of Use	Type of User	Rate	Method
Biochar to compost ratio can be 10-25% for soil amendment applications			
Potting soil	Homeowner	10-25% mixed	Use mix for starting plants
Ag field soils	Commercial Producer	10-25% mixed **3 tons/ac or 1.5 lbs/10 sq.ft. of the mix.**	Surface apply and incorporate as soon as possible.
Garden	Homeowner	10-25% mixed **3 tons/ac or 1.5 lbs/10 sq.ft. of the mix.**	Broadcast and dig in by hand or with a tiller or apply in row/in bed.
Orchards	Homeowner	10-25% mixed	Dig 8"-12" deep holes 3'-5' apart just inside the dripline of the tree and fill with biochar/ compost mix
Forests	Commercial & Homeowner	Up to rates: **Biochar alone - 5 lbs./10 sq.ft.** **Biochar/compost mixed - 10 lbs./10 sq.ft.**	Incorporate to accelerate benefits.
Tree trans-plant holes	Homeowner	25% biochar 25% compost 50% native soil	Fill the transplant hole with layers of bio-char/compost mix and soil from the hole