TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE
PLANT MATERIALS - 8 SPOKANE, WASHINGTON
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MULCHES AND MULCHING FOR EROSION CONTROL

This Technical Note is subdivided into the following Sections:

Section 8.1 Mulches
Section 8.2 Mulching for Erosion Control

SECTION 8.1 Mulches

Mulches are products that are placed on the soil surface to improve conditions for seed germination, decreases evaporative losses, reduce weed competition, and/or improve soil stability.

Wood and Bark Mulches

Forest byproducts are readily available in most of the PNW. They do not degrade rapidly and are easily applied to most soil surfaces. Water does not readily evaporate under a good cover of wood/bark mulch. Annual weeds are generally not much a problem for a few years.

Various wood and bark mulches. Photo courtesy of Timber Rock Landscape Center.

Wood and bark are less effective per unit weight than straw and may discourage plant growth if applied at excessive rates. Wood and bark have very high carbon:nitrogen ratios.

Material	C:N Ratio
Douglas fir wood	208:1
Ponderosa pine	300:1
Engelmann spruce	142:1
Grand fir	186:1
Larch	360:1
Composted bark	60:1
Straw	373:1

Nitrogen in the soil will be tied up during the breakdown of wood and bark thus making it unavailable for plants. While this might seem undesirable, it can be beneficial. Low nitrogen levels can impede weed growth, and many of our conservation plants do not respond well to high nitrogen levels. Nitrogen will be released over a period of a few years and this slow released nitrogen is usually ample for conservation species.

Compost

A compost pile. Photo courtesy of University of Maine Cooperative Extension Bulletin 1159.

Composting is the transformation of organic material through decomposition into a soil-like material called compost. Insects, earthworms, bacteria and fungi all contribute in transforming the material into compost. Bark, wood debris, leaf litter, and straw are excellent sources of compost mulch for conservation uses. These raw materials produce compost that is durable and easily spread.

Nutrient availability of composted materials is generally higher than in raw materials. This can be advantageous in severely depaupered soil such as road cuts that expose parent material.

Wood/Straw Fiber Mats/Blankets

Wood and straw can be partially chemically digested and the "mash" is extruded in long filaments. The filaments are used to make special porous mats or blankets. The mats/blankets are rolled, easily installed, and provide excellent soil protection.

Curlex wood matting. Photo courtesy of Wolbert & Master Inc.

Mats require a well prepared, smooth site for proper installation. The mats are rolled out and pinned to the soil using heavy wire pins or wood stakes. The mats usually degrade in place within 24 months of application. Mats are frequently manufactured with polymer netting that degrades under UV light. The rate of degradation varies so it important to select the proper polymer netting for your project.

Wood/Straw Pellets

Wood and straw pellets are produced similarly as fiber mats except pellets are produced rather than filaments. Pellets are easily broadcast and require far less site preparation than mats.

Coconut Fiber

Coconut fiber is typically sold as mats in the PNW. Coconut fiber mats are easily installed on smooth soils. They provide excellent soil protection and are not visually obtrusive.

Coconut Fiber. Photo courtesy of alibaba.com.

Straw

Straw is the most readily accessible mulch material in the PNW. It is inexpensive, conveniently packaged as bales, fairly durable, and easily applied. It provides excellent soil protection against wind erosion.

Straw is very light and very susceptible to wind so it must be anchored for maximum benefit. It readily floats and can be a nuisance in areas where water flows.

Straw. Photo courtesy of Beaver Brook Landscape Supply, LLC.

PAM in granular form. Photo courtesy of Emerald Seed & Supply.com

Inorganic Mulches

Tackifiers are not used by themselves but are combined with organic mulches. Tackifiers are added to organic mulches to improve adherence to the soil. Hydromulches almost always include a tackifier.

Polymers are synthetic compounds that alter soil aggregation. PAM (Polyacrylamide) is the most common polymer on the market. It is a synthetic water-soluble polymer made from monomers of acrylamide. PAM binds soil particles together. Once soil particles suspended in water are bound together by PAM, they settle out, so water has a harder time washing them out of the field.

Rock is often overlooked but is an excellent inorganic mulch because it holds up exceedingly well and dissipates energy of falling water very well.

SECTION 8.2 Mulching for Erosion Control

Mulching nearly always shortens the time needed to establish a suitable plant cover. A mulch can dramatically improve water availability and buffer surface temperature extremes. Mulching can even substitute for soil coverage over seeds in moist environments. For example, many hydroseed operators will use a two step process. The first step is an application of fiber + seed. The second step is an application of fiber + tackifier that is applied over the seed/fiber layer.

Straw Spreading and Blowing

Straw spreading and blowing is one of the least costly mulching techniques in the PNW. Straw bales are broadcast by hand, machine, or special wind blast machines. It requires fairly good access to the site. Blowers make it much easier to mulch uphill slopes.

Straw moves off-site easily so it should be anchored. Anchoring (also known as pinning & crimping) can be easily accomplished by cat walking. The cleats of the cat press the straw into the cracks. A sheep's-foot roller pulled behind a tractor or front-end loader also does an excellent job of anchoring straw. An empty drill with heavy press wheels can effectively anchor straw. Spiral rollers also anchor straw quite fairly well but the straw is less likely to stand up and help reduce wind erosion. Harrows and other implements that are pulled through the soil are not recommended because the straw will rake up rather than anchor.

Typical application rates are 1000-8000 pounds per acre. In general, more straw provides better erosion protection. High amounts can interfere with seedling emergence. A rule of thumb is "some soil should be visible if plant growth is needed." High amounts of straw also shelters rodents that may girdle trees and shrubs.

A hydromulched field. Photo courtesy of Fiber Clay Products.

Hydromulching

Hydromulching has become very common because quality equipment and materials are readily available. Most hydromulching contractors utilize a fiber + tackifier slurry. The slurry may or may not contain seed and fertilizer. Hydromulching is particularly attractive in areas with steep slopes where equipment accessibility is difficult and unsafe.

Typical application rates are 500-3000 pounds per acre. Approximately 1000 gallons of water is required for every 500 pounds of wood fiber.

Laying Erosion Mats/Blankets

Fiber mats are frequently used on slopes where water erosion is a severe hazard. Roadside cut slopes and riparian areas are common sites where blankets are used. Blankets are also very useful for revegetating areas where foot traffic is a problem. People are less likely to walk on a fiber blanket than a straw mulch. Fiber mat manufacturers will provide pinning recommendations and these should be followed.

Laying erosion blankets. Photo courtesy of Chicago Wilderness Magazine.

Inadequate pinning greatly increases chances that the mat will not function properly.

Typical application rates are one layer with 12" overlap where mats merge. Pins or stakes are placed 2-5 feet apart with more pins needed for steeper slopes.

Rip Rap rock used for erosion control in a water channel. Photo courtesy of the Erosion Control Technology Council.

Rock & Gravel Facing

Rock and gravel are useful products for stabilizing soils that are very prone to erosion. No special tools are required but it is extremely important to consider weight. Rock and gravel are very heavy, costly to transport, and require stout equipment to handle.

Typical application rates are 2-3 inch deep which is roughly equivalent to 300-400 tons per acre.