

Description Mulching is a temporary soil stabilization or erosion control practice where materials such as straw, grass, grass hay, compost, wood chips or wood fibers are placed on or incorporated into the soil surface. In addition to stabilizing soils, mulching can reduce the velocity of stormwater runoff over an area. When used together with seeding or planting, mulching can aid in plant growth by holding the seed, fertilizers, and topsoil in place, by helping to retain moisture, and by insulating against extreme temperatures.

Mulching protects the soil surface from splash erosion. It retards runoff, traps sediment, and creates more favorable conditions to assist germination and the early development of plants. The following natural and synthetic (stabilizers) mulches are suitable for use at construction sites:

Vegetative materials: wheat straw, rye straw, barley straw, grass hay

Wood products: wood cellulose fibers, wood chips, bark, sawdust

Other organic materials: leaves, peat, manure, compost

Rock products: gravel, slag, crushed stone

Fabricated mulch: jute, burlap, coconut (coir), excelsior, Kraft paper string

Synthetic mulch: asphalt, vinyl, plastics, latex, rubber, adhesives or “tackifiers.”

- Applications**
- Mulch is an immediate, effective, and inexpensive means of controlling dust and erosion and aiding revegetation of construction sites. It provides immediate protection to soils that are exposed and that are subject to heavy erosion; it retains moisture (which may minimize the need for watering); and it requires no removal because of natural deterioration of most mulching materials.
 - Mulch is often used alone in areas where temporary seeding cannot be used because of the season or climate. It may be used in conjunction with other treatments for increased effectiveness. Use of mulch may or may not require a binder, netting, or tacking agent to hold the mulch in place. On steep slopes and critical areas such as waterways, mulch matting is used with netting or anchoring to hold it in place.
 - To aid in establishing vegetation, mulch seeded and planted areas where slopes are steeper than 2:1, where runoff is flowing across the area, or when seedlings need protection from bad weather. If the mulching effect is to be maintained longer than 3 months, the preferred mulch is vegetative material. Wheat straw is the most preferred vegetative material, followed by rye straw, barley straw, or grass hay.
 - Wood chips are suitable for areas that will not be closely mowed and around ornamental plantings. Chips decompose slowly and do not require tacking, but they should be treated with nitrogen to prevent nutrient deficiency. Wood chips can be very inexpensive if they are obtained from trees cleared on the site. Chips should not be used on slopes greater than 6% because they tend to wash down slopes.

- Bark mulch is suitable for areas planted with grasses that will not be closely mowed. The bark may be applied mechanically or by hand.
- Crushed stone and gravel mulches are appropriate for dust control and soil protection on low-use dirt roads, driveways, and other areas of light vehicular activity within the construction site.

Limitations

Drainage area – 2 ac.	Maximum slope – 50%
Minimum bedrock depth – N/A	Minimum water table - N/A
NRCS soil type - ABCD	Freeze/thaw – fair
Drainage/flood control – no	

Disadvantages of mulch include the following:

- It may delay germination of some seeds because cover reduces the soil surface temperature.
- Mulch can be easily blown or washed away by runoff if not secured or incorporated. Lightweight mulch, such as straw, requires matting, crimping, or other methods to hold it in place.
- Some mulch materials, such as wood chips, may absorb nutrients necessary for plant growth.
- Straw mulch provides organic matter as it breaks down and is incorporated into the soil. If applications are too heavy, however, soil nutrient levels (especially nitrogen) may decline during the period of decomposition. Therefore, prescribed application rates of both the straw mulch and the specified fertilizer should be strictly followed. The use of a fertilizer low in phosphorus is recommended.
- Synthetic spray-on materials are not recommended except for temporary dust/erosion control or for steep, rocky slopes where other mulches and mechanical methods cannot be effectively applied. The synthetic mulches may create impervious surfaces and can have adverse effects on water quality.
- Avoid applying mulch as the only control on long slopes. Break up concentrated flows on these slopes using recommended methods in other BMPs.

Targeted Pollutants

Sediment
Phosphorus

Design Parameters

Stone and gravel:

- After the gravel or stone is applied, construction traffic may move over it. Areas that become compacted or depressed should be remulched to the same level as the remaining area to prevent flows from the site from becoming channelized into these depressions.
- Upon completion of activities on the site, the gravel or stone mulch may be left in place during revegetation operations.
- When used for driveways or dirt roads, a filter blanket should be placed under the gravel.

Straw:

- Straw mulch forms a loose layer when applied over a loose soil surface. To protect the mulch from wind drifting and water damage, it should be stabilized by covering it with netting, such as jute, or by spraying it with a tacking agent. Straw mulch should cover the entire seeded area or exposed slope. The mulch should extend into existing vegetation or stabilized areas on all sides to prevent wind or water damage which may start at the edges of the mulched area
- The straw fibers should be applied to form a uniform cover of loose straw through which 20% or less of the original ground surface can be seen. No large clumps of unscattered straw should exist after application.
- On small slopes, straw mulch should be applied by hand broadcasting to a uniform depth of 2 to 3.1 in. On larger slopes, straw can be blown onto the slope to achieve a uniform cover of 2 to 3.1 in.

Wood chips:

- Due to bacterial action during decomposition, nutrient concentrations in the soil may be depressed under a layer of wood chips. Because of this, applications should not exceed the specified thickness that would cause a marked decline in some soil nutrients for longer periods.
- When using wood chips to mulch revegetation projects, the specified application of fertilizer should be increased approximately 25% to replenish soil nutrients lost due to breakdown of wood chips.

Effectiveness of mulches:

- Crushed stone and gravel mulches retain their effectiveness indefinitely if properly applied and protected from compacting traffic. Sediment generation reduction is estimated at 70 to 90%, and nutrient generation reduction at 50 to 70%.
- Straw mulches react similarly to hydromulches, as they break down fairly rapidly. However, straw is twice as effective and at about half the cost of hydromulches. Sediment reduction by straw mulch without vegetation is 90 to 95% for a few months. It drops to 70 to 90% in 6 months, and further to 40 to 60% in 2 years, and 10 to 30% after that. Nutrient reductions are estimated at 60 to 80% for a few months, 50 to 70% in 6 months, 20 to 50% up to 2 years, and 0 to 10% beyond 2 years.
- Wood chips deteriorate more slowly than wood fiber and, therefore, retain their effectiveness longer. Sediment reductions of 90 to 95% can be expected for 1 year, 80 to 90% up to 2 years, and 50 to 60% beyond 2 years. Nutrient reductions of 60 to 80%, 50 to 70% , and 30 to 50% are estimated for the same period.

Construction Guidelines

- Seeding (temporary or permanent) can take place prior to or concurrent with mulching. Other surface runoff control measures should be installed prior to seeding and mulching. If seed is applied prior to mulch, mulch should be applied to seeded areas immediately after seeding.
- Mulches should not be applied when free surface water is present, but may be applied to damp ground.
- The choice of materials for mulching will be based on the type of soil to

be protected, site conditions, season, and economics.

Straw mulch: The straw should be stabilized to prevent it from being damaged by water or wind (blown away). Use one of the following methods to apply straw mulch:

- Hand punching can be used on small sites, sites with rock and stone on the surface, sites with slopes that are steeper than 3:1, or sites that have been wattled. Take care not to damage wattling or planted vegetation. Use a spade or shovel to punch the straw into the slope until all areas have straw standing perpendicularly to the slope and embedded at least 4 in. into the slope. The bunches of straw should resemble the tufts of a toothbrush.
- Roller punching can be used on large, gently sloping sites without significant outcroppings of rock and stone. Roller punching should not be used on sites that have been wattled (unless there is adequate space between lines of wattling) or on planted sites. A roller equipped with straight studs not less than 6 in., from 4 to 6 in. wide, and approximately 3/4 in. thick, will best accomplish the desired effect. Studs should stand approximately 8 in. apart and should be staggered. All corners should be rounded to prevent withdrawing the straw from the soil. Vegetative planting may be conducted following roller punching.
- Crimper punching involves specially designed straw-crimping rollers. These are suitable for use wherever roller punching can be used. The crimpers consist of serrated disk blades, set 4 to 8 in. apart, that force straw mulch into the soil. Crimping should be done in two directions with the final pass conducted across the slope rather than up and down it.
- Tacking agents may be used on any type of site, but are best used only on very stony or rocky soils or small, steep slopes. Apply 28.5 ft³/ac. of the tacking agent or its equivalent over the straw mulch. Agents that are neutral or nearly neutral in color and of demonstrated effectiveness for the soils and climate of the application area are acceptable.
- Matting may be used on large, steep areas that cannot be punched with a roller. Jute or wood excelsior on plastic netting should be applied over unpunched straw according BMP 18-Matting.

Maintenance	Inspect all mulched areas periodically (according to the inspection interval prescribed in the project site stormwater plan and after runoff-producing storm events. Repair damaged areas of the mulch immediately. Reseed or replant such areas, if necessary, before replacing the mulch cover. Straw mulch and other organic products do not have to be removed when the vegetation becomes established.
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Table 15-1 shows the various mulches and their application rates.

Table 15-1. Guide to Mulch Materials, Rates and Uses				
Mulch Material	Quality Standards	Application Rate 1100 ft ²	Depth and Coverage	Remarks
Gravel, slag, or crushed stone	Washed, 3/4 to 1 1/2 in. diameter with at least 30% of it larger than 3/4 in. diameter	280 ft ³ (or more to ensure 90% coverage at 2.5 tons/1100 ft ²	2.75 to 3.1 in. uniform covering	Excellent mulch for short slopes around woody plants and ornamentals. Use where subject to foot traffic. Approximately 42.5 lb/ft
Hay or straw	Air dried, free of unwanted seeds and coarse material. Fibers should not be chopped or ground to reduce fiber length. Minimum fiber length - 8 in.	88 TO 110 lb (2 to 3 bales)	2 to 3.1 in. to form a uniform mat through which 20 to 40% of the original ground surface can be seen.	Use where the mulching effect is to be maintained for >3 months. Subject to blowing unless kept moist, punched, or tacked down. Most common and widely used mulching material. Can be used in critical erosion areas.
Wood fiber cellulose	Dyed material should not contain any growth inhibiting factors	22 to 33 lb		If used on critical areas, double the normal application rate. Apply with hydromulch. No tie-down required. Packaged in 110 lb bags
Wood chips	Do not use kiln-dried or air-dried material. Chip size 1/2 x 1 1/2 in. diameter and 1/10 to 1/2 in. thick		2.75 to 3.1 in. uniform depth	Applying at over the specified thickness may markedly reduce soil nutrients for a long time. Increase fertilizer 25% with wood chip mulch on revegetation sites.
Compost	Odorless or earthy smell	5.3 to 53 ft ³	2 to 3.1 in. uniform depth	Inexpensive, but may not be available in some areas.