

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

MULCHING

(Ac.)

CODE 484

DEFINITION

Applying plant residues or other suitable materials produced offsite, to the land surface.

PURPOSE

Conserve soil moisture;
Moderate soil temperature;
Provide erosion control;
Suppress weed growth;
Facilitate the establishment of vegetative cover;
Improve soil condition; and
Reduce airborne particulates.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all lands where mulches are needed. This practice may be used alone or in combination with other practices.

CRITERIA

General Criteria Applicable to All Purposes

The selection of mulching materials will depend primarily onsite conditions and the material's availability. Mulch materials shall consist of natural and/or artificial materials that are environmentally safe such as plant residue, wood bark or chips, gravel, plastic, fabric, rice hulls, or other equivalent materials of sufficient dimension (depth or thickness) and durability to achieve the intended purpose for the required time period.

Prior to mulching, the soil surface shall be prepared in order to achieve the desired purpose.

Straw mulches consisting of wheat, barley, and/or oats are the most common mulches.

Application rates can vary, but average one to two tons per acre. Care must be taken to use certified weed free straw to prevent the introduction of noxious weeds onto the site. Mulch material shall be relatively free of disease, pesticides, chemicals, noxious weed seeds, and other pests and pathogens. Stems need to be as long as possible to increase its life expectancy as a mulch. Straw can be placed on the site by hand or with a blower for large areas. Straw mulch often needs to be anchored to prevent being blown away or washed away by overland water flow. The use of tackifiers, plastic, or biodegradable netting is an effective way to retain the straw on the site. Mechanical crimpers have also been used to push the straw into the soil surface on sites where the use of heavy equipment is feasible.

Hydromulching with wood fiber or paper in a water slurry is another form of mulching. This requires the use of a machine called a hydromulcher or hydroseeder and equipment access to the site. Wood fiber mulches are usually more effective than paper mulches because the longer wood fibers adhere to the soil and are more resistant to wind and water erosion. Hydromulch is often applied at average rates of 1,500 pounds (lbs.) to the acre and a tackifier can be used to help it stay on the slope. Incorporation of seed and fertilizer in the mix is not a good idea because much of the seed will not be in contact with the soil and can be lost to desiccation. Fertilizer in the slurry can create a high salt concentration that can reduce water adsorption and kill the seed.

Perennial native or introduced grass should have at least 50 percent of the stems and leaves, by weight, 10 inches long or longer, before being applied to the site. Hay containing mature seed may be used if it is the same species and/or variety as the species used in planting. Native hay mulches often contain high

levels of noxious weed seed or other undesirable plant species. Great care must be exercised when using native hay; if the introduced species are desirable, then native hay can result in increased diversity of the resulting plant community. Therefore, native and introduced hay mulch should be free of noxious weed seed and mold. (Refer to the appropriate purpose and application rate: 70 percent = 2,000 lbs. and 100 percent = 4,000 lbs.).

Small grain straw shall consist of wheat, oats, barley, or rye straw from which the grain has been removed. At least 50 percent of the stems, by weight, should exceed 6 inches in length before being applied to the site if anchored by resin, netting, tackifiers, etc. When anchored mechanically, 50 percent of the stems, by weight shall exceed 10 inches in length. (Refer to the appropriate purpose and application rate: 70 percent = 2,000 lbs. and 100 percent = 4,000 lbs.).

Woodchips, sawdust, and bark can also be used as mulch. These can be quite inexpensive if local sources are present. Wood residues are very long lasting compared to other mulches. However, nutrients like nitrogen can get tied up and immobilized in the wood during the decay process. The addition of fertilizer can help offset nitrogen deficiencies during decomposition.

Wood fiber mulch should be cut from green timber. The timber should be cut for maximum fiber length and at slight angle to the wood grain to promote splintering while weathering. As a guide, 50 percent of the fibers, by weight, need to be 6 inches in length.

Spread mulch uniformly by hand or mechanically. When spread by hand, the bales of hay must be torn apart, "fluffed up," and spread uniformly over the area. For uniform distribution of hand spread mulch, divide the area into 1,000-square foot sections. Mechanically applied mulches should not be applied when wind velocities exceed 15 miles per hour.

The use of premade erosion control mats are also effective for revegetation and rehabilitation projects. These mats come in a variety of types, sizes, and strengths and can be expensive. Mats made from straw and/or coconut fiber with biodegradable netting are

rolled onto the site and secured with metal staples. Stronger mats, either pure coconut fiber or synthetic fibers need to be used on sites with high erosion hazards, high velocity overland flow rates, or steep slopes.

Mulching after seeding can improve the success of the revegetation by keeping the seed in contact with soil, moderating temperatures, and reducing water loss necessary for the seed to germinate. Mulching around planted seedlings can also improve water availability and provide protection from the environment.

If soil crusting has occurred on the surface of the soil prior to seeding, the crust must be broken up and the application of a mulch and tackifier should be utilized. If rainfall has occurred on disturbed areas prior to seeding, crusting has probably occurred. Stockpiling the organic layer and topsoil while building roads or other activities for redistribution later is a very good idea. One of the biggest problems in poor revegetation success is the lack of organic matter and nutrients needed by the plants. Sampling soil pH, bulk densities, and nutrient levels present on and in the seedbed will provide information to help decide if soil amendments, mulches, fertilizers, or other cultural treatments are necessary.

Anchoring

Hay, straw, or wood fiber mulches should be anchored using one of the following hand methods:

When using mulch netting staple lightweight paper, jute, cotton, or plastic netting to the soil surface according to the manufacturer's recommendations. The mesh size of the fabric should not exceed one and one-half inches by three inches. The plastic netting should contain a carbon black additive for longer life durability.

When using slit anchoring use a square pointed spade and cut mulch into the surface soil in contour rows 12 inches apart.

If mulch is anchored mechanically, use the following methods:

The seedbed must be tilled to a minimum of four to six inches deep immediately before placing and anchoring mulch material. Use a heavy, straight, disk type mulch tiller. The disk should be one quarter-inch thick and of

sufficient diameter to prevent the frame from dragging the mulch. The edges should be dull so as not to cut the mulched hay/straw during the anchoring process. The edges may be serrated or smooth. If serrated, the scallops will not be more than three inches in length and three-quarter-inch in depth.

The rows of furrows made by the mulch tiller should be spaced not more than nine inches apart. Penetration depth should be about two to three inches. The mulch will not be covered with excessive amounts of soil. Limit to no more than two passes by the disk. All mulching operations will be completed as close to the contour as possible.

A farm disk set straight may be used if weight is added to provide adequate penetration depths and if it tucks the material without cutting.

Travel speeds must be reduced to prevent excessive burial of seed and mulch material.

If resin emulsion mulch tackifier is used, apply with the following method:

Resin emulsion shall consist of liquid emulsion of water and natural petroleum or acrylic resins prepared specifically for soil stabilization of a type and grade similar to Petroset SB, American Cyanamide, Aerospray 70, or Curosol AH.

The resin is applied with a mechanical mulch blower equipped with an emulsion spray system. Resin should be applied continuously to the mulch as it passes through the nozzle end of the mulch blower and is broadcast upon the ground.

Do not apply resin to the surface of the mulch after it is spread on the ground. Do not apply resin when the air temperature is less than 50 degrees F.

Follow manufacturer's recommendations for proper application rates.

When a soil retention blanket is used, use the following method:

A soil retention blanket is made of a uniform web of interlocking wood fiber that has a backing of mulch net fiber on one side only. The fibers should be made from aspen wood and should be 0.021 inch by 0.042 inch plus or minus 25 percent and a minimum of 4

inches in length. The top side is covered with extruded plastic netting. Maximum mesh size shall not exceed two inches by one inch.

For longer life and durability, netting with carbon black additive is recommended. Thickness of the blanket shall not be less than one-quarter-inch before installation.

Roll weight shall average 0.8 pounds per square yard plus or minus 10 percent at the time of manufacturing. This information will be stenciled on the roll wrapper or attached tag. Staples used to anchor retention blankets should be U-shaped, 11-gauge or heavier wire, approximately 2 inches wide at the throat, and a minimum of 8 inches in length.

Place blanket with the netting on top and the fibers in contact with the soil over the entire area to be covered. The blanket should be unrolled approximately along the contour of the slope. Begin at the bottom of the slope. Lap each subsequent roll approximately four inches over the adjoining roll.

When used in water overflow areas, the blanket should be unrolled in the direction of flow and lapped four inches over the adjoining downstream roll. When using two or more blankets side by side in a ditch, do not put the seam (lapped edges of the adjoining blankets) in the center of the water flow. Offset seam 6 to 12 inches. In drainages, blanket shall be placed to cover design flow depths.

Blanket must be stapled at joints, corners, and approximately five-foot intervals along the sides and lapped edges. Exterior ends and edges shall be buried to prevent undercutting by water or wind.

Other Mulches

Wood Chips or Bark: Wood chips or bark are well suited for mulching of woody plantings. Use bark chips from fir, pine, larch, hemlock, or western red cedar that have a maximum dimension of three inches or shredded particles from the bark. A layer of bark or chips greater than one inch may affect seedling emergence.

Cover the entire area when making mass shrub or tree plantings. For single plant seeding, spread chips or bark around the base and

extend outward 18 inches from the main stem or trunk. Applying a depth of three to four inches will assist in controlling weed competition.

Do not use in water flow areas.

Synthetic Mulch (Fabric)

Synthetic fabric may be pin-punched polyethylene, woven polypropylene, or some other rot-resistant material. Roll fabric will be a minimum weight of three ounces per square yard and carry a manufacturer warranty for five years. The minimum width for continuous rows is six feet with four feet exposed after installation. See Woodland Technical Note No. 38 for additional installation guidance.

As a minimum, manufactured mulches shall be applied according to the manufacturer's specifications.

Mulching operations shall comply with federal, state, and/or local laws and regulations during the installation, operation, and maintenance of this practice.

Additional Criteria to Conserve Soil Moisture

Mulch materials applied to the soil surface shall provide at least 60 percent surface cover to reduce potential evaporation.

Additional Criteria to Moderate Soil Temperature

Mulch materials shall be selected and applied to obtain 100 percent coverage over the area treated. The material shall be of a significant thickness to persist for the period required for the temperature modification.

Additional Criteria to Provide Erosion Control

When mulching with cereal grain straw or grass hay, apply at a rate to achieve a minimum 70 percent ground cover. Mulch rate shall be determined using current erosion prediction technology to reach the soil erosion objective.

When mulching with wood products such as wood chips, bark, or shavings or other wood materials, apply a minimum two-inch thickness.

When mulching with gravel or other inorganic material, apply a minimum 2 inch thickness and shall consist of pieces 0.75 to 2 inches in diameter.

Additional Criteria to Suppress Weed Growth

The thickness of mulch will be determined by the size of the plant being mulched. Mulches shall be kept clear of the stems of plants where disease is likely to occur. Mulches applied around growing plants or prior to weed seedling development shall have 100 percent ground cover. Thickness of the mulch shall be adequate to prevent emergence of targeted weeds. Plastic mulches may be used.

Additional Criteria to Establish Vegetative Cover

Mulch shall be applied at a rate that achieves a minimum of 70 percent ground cover to provide protection from erosion and runoff and yet allow adequate light and air penetration to the seedbed to ensure proper germination and emergence.

Additional Criteria to Improve Soil Condition

Apply mulch materials with a carbon to nitrogen ratio (C:N) less than 30:1 so that soil nitrogen is not immobilized by soil biota. Do not apply mulch with C:N less than 20:1 to an area of designed flow in watercourses.

Use the Soil Conditioning Index to assess soil quality impacts and to determine the type and rate of the mulching material.

Additional Criteria to Reduce Airborne Particulate Matter from Wind Erosion

Mulch rate shall be determined using current wind erosion prediction technology to reach the soil erosion (movement of particulates offsite) objective.

CONSIDERATIONS

Evaluate the effects of mulching on evaporation, infiltration and runoff. Mulch material may affect microbial activity in the soil surface, increase infiltration, and decrease runoff, erosion and evaporation. The temperature of the surface runoff may also be lowered.

Mulch material used to conserve soil moisture should be applied prior to moisture loss. Prior to mulching, ensure soil under shallow rooted crops is moist, as these crops require a constant supply of moisture.

Mulch materials with a high water holding capacity and/or high impermeability to water droplets may adversely affect the water needs of plants.

Fine textured mulches (e.g., rice hulls) which allow less oxygen penetration than coarser materials should be no thicker than one or two inches.

Organic materials with C:N ratios of less than 20:1 will release nitrate-nitrogen which could cause water quality impairments.

Mulching may also provide habitat for beneficial insect and provide pest suppression.

Clear and infra-red transmissible (IRT) plastics have the greatest warming potential. They are transparent to incoming radiation and trap the longer wavelengths radiating from the soil. Black mulches are limited to warming soils by conduction only and are less effective.

Clear mulches allow profuse weed growth and may negate the benefits of soil warming. Black mulches provide effective weed control.

Wavelength selective (IRT) plastic provides the soil warming characteristics of clear mulch with the weed control ability of black mulch.

Low permeability mulches (e.g., plastic) may increase concentrated flow and erosion on unmulched areas.

Consider potential toxic allelopathic effects that mulch material may have on other organisms. Animal and plant pest species may be incompatible with the site.

Consider the potential for increased pathogenic activity within the applied mulch material.

Keep mulch three to six inches away from plant stems and crowns to prevent disease and pest problems. Additional weed control may be needed around the plant base area.

Deep mulch provides nesting habitat for ground-burrowing rodents that can chew extensively on tree trunks and/or tree roots. Light mulch

applied after the first cold weather may prevent rodents from nesting.

Some mulch material may adversely affect aquatic environments through changes in water chemistry or as waterborne debris. Consider placing mulch in locations that minimizes these risks.

PLANS AND SPECIFICATIONS

Specifications shall be prepared for each site and purpose and recorded using approved specification sheets, job sheets, technical notes, narrative statements in the conservation plan, or other acceptable documentation.

Documentation shall include:

Purpose of the mulch;

Type of mulch material used;

The percent cover and/or thickness of mulch material;

Timing of application;

Site preparation;

Listing of netting, tackifiers, or method of anchoring; and

Operation and maintenance.

OPERATION AND MAINTENANCE

Mulched areas will be periodically inspected, and mulch shall be reinstalled or repaired as needed to accomplish the intended purpose.

Removal or incorporation of mulch materials shall be consistent with the intended purpose and site conditions.

Operation of equipment near and on the site shall not compromise the intended purpose of the mulch.

Prevent or repair any fire damage to the mulch material.

Properly collect and dispose of artificial mulch material after intended use.

Monitor and control undesirable weeds in mulched areas.

REFERENCES

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