

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**MULCHING**

(Ac.)

**CODE 484**

**DEFINITION**

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

**PURPOSE**

This practice supports one or more of the following purposes:

- Conserve soil moisture (Resource concern - INSUFFICIENT WATER – Inefficient moisture management).
- Reduce energy use associated with irrigation (Resource concern - INEFFICIENT ENERGY USE – Farming/ranching practices and field operations, and INSUFFICIENT WATER – Inefficient moisture management).
- Provide erosion control (Resource concern - SOIL EROSION– Excessive bank erosion from streams shorelines or water conveyance channels, and/or SOIL EROSION – Concentrated flow erosion, and/or SOIL EROSION - Sheet, rill, & wind erosion).
- Facilitate the establishment of vegetative cover (Resource concern - DEGRADED PLANT CONDITION – Undesirable plant productivity and health).
- Improve soil health (Resource concern - SOIL QUALITY DEGRADATION – Organic matter depletion).
- Reduce airborne particulates (Resource concern - AIR QUALITY IMPACTS - Emissions of Particulate Matter - PM - and PM Precursors).

**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 on the purpose(s) for the mulch application site conditions and the material's availability. Mulch materials shall consist of natural and/or artificial materials that are 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.

The mulch material shall be evenly applied and, if necessary, anchored to the soil. Tackifiers, emulsions, pinning, netting, crimping or other acceptable methods of anchoring will be used if needed to hold the mulch in place for specified periods.

In cases where excessive furrow erosion may occur due to concentrated flows from plastic mulches, appropriate measures will be taken to protect the furrows.

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

Mulch material needs to be of a quality to meet the intended purpose.

**Additional Criteria to Conserve Soil Moisture and/or Reduce Energy Use Associated with Irrigation**

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

**Additional Criteria to Provide Erosion Control and to Reduce Airborne Particulates**

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 (RUSLE2) to reach the soil conservation objective.

When mulching with wood products such as wood chips, bark, or shavings or other wood materials, apply a minimum 2-inch thickness comprised of particles that remain in place during heavy rainfall and or strong wind events.

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 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 Health**

Use plant-based mulching materials of suitable quantity and quality to add organic matter, provide food and shelter for soil biota, and protect the soil surface from raindrop impact and crusting, while allowing for adequate soil aeration.

Apply mulch materials with a carbon to nitrogen ratio (C:N) less than 30 to 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.

An evaluation of the system using the current approved soil conditioning index (SCI) procedure results in zero or higher.

**CONSIDERATIONS**

The use of mulch on crops may reduce the need for pesticides. However, be aware that incidence of slugs or insects may be increased with mulch use, and mulch materials that contain weed seed may actually increase weed populations.

Where weed control is an issue, small grain straw is a better mulching material than hay or incompletely composted manure, which harbor unwanted seeds. Note that of the small grains, barley straw may contain retained seeds which will result in undesired volunteer grain plants. If raising small grain specifically for straw, harvest prior to grain maturation to avoid this problem.

Mulch can protect against winter injury protection in perennial crops, such as strawberries. Barley straw is not recommended for strawberries. Grain will attract turkeys, which will cause damage to the plants.

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 2 inches.

Avoid excessively thick or tightly packed mulches that can result in soggy, anaerobic conditions at the soil surface during wet weather; or prevent rainfall or overhead irrigation from reaching the soil during times of moisture deficit

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

Finely-divided plant residues (e.g., sawdust) and those rich in soluble carbohydrates (e.g., fresh

green-chopped sorghum-sudangrass, corn, or other grasses) that have a C:N ratio greater than 30 can tie up soil N and necessitate supplemental N applications on crops. Coarser materials such as grain straw and chipped brush usually do not reduce crop-available soil N levels unless and until they are incorporated into the soil by tillage or cultivation.

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

Use mulch of sufficient ground cover, and suitable thickness and texture to provide habitat for ground beetles, spiders, and other predators of weed seeds and crop pests. Select crops to be mulched, mulching materials, and rates of application that do not contribute to pest problems. Avoid excessively thick or tightly-packed mulches, which can interfere with the movement of ground beetles and other beneficial organisms, and may increase the incidence of crop pests and diseases.

During the period when weed seed predation is desired and predators are most active, avoid pesticide applications or pesticide exposures that could adversely affect weed seed consumers.

Low permeability mulches (e.g. Plastic) may increase concentrated flow and erosion on un-mulched areas.

Light-reflecting mulches such as white or aluminized plastic film or bright straw can repel some pests.

Select mulching materials and methods that are compatible with the crop and site. Consider potential beneficial or detrimental effects of mulching materials on the biotic community surrounding the crop, including beneficial soil micro- and macro-organisms, as well as plant pathogens and plant pests. These effects are specific to site, mulch, and crop, and may include enhanced soil microbial activity, increased or reduced levels of crop diseases, and toxic (allelopathic) activity against the crop, weeds, or other beneficial or pest organisms.

Keep mulch 3 to 6 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.

Consider potential effects of soil physical and chemical properties. Refer to soil survey data as a preliminary planning tool for assessment of areas. Consult the Web Soil Survey at: <http://websoilsurvey.nrcs.usda.gov/app/> to obtain Soil Properties and Qualities information.

For all organic or transitioning to organic operations, follow all National Organic Program (NOP) rules.

#### **PLANS AND SPECIFICATIONS**

Specifications shall be prepared for each site and purpose and recorded in the approved implementation requirements 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.

Evaluate the effectiveness of the mulch (application, amount of cover provided, durability, etc.) and adjust the management or type of mulch to better meet the intended purpose(s).

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.

**TABLE 1A. GUIDE TO MULCH MATERIALS**

<b>Mulch Material</b>	<b>Quality Standards</b>	<b><u>Application Rates</u></b>	
		<b>per 1000 Sq. Ft.</b>	<b>per Acre</b>
Hay or Straw	Air-dried; free of undesirable seeds and coarse materials	70-90 lbs.	1.5 - 2 Tons
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Cornstalks, Shredded or Chopped	Air-dried, shred-dried into 8" to 12" lengths	185-275 lbs.	4-6 tons
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Compost or Manure	Well shredded, free of excessive coarse material	370-550 lbs.	8-12 tons
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Wood Chips or Shavings	Green or air- dried. Free of objection- able coarse materials.	460-920 lbs.	10-20 tons
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Wood Excelsior	Green or air-dried burred wood fibers .024" x .031" x 4"	90 lbs. (1 bale)	2 tons
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Sawdust Green or Composted	Free from objectionable coarse material	83-500 cu. ft.	--
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Wood Fiber Cellulose (Partly digested wood fibers)	Made from natural wood usually with green dye and dispersing agent added. Max. 15% moisture packed.	50 lbs.	2000 lbs.
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Peat Moss	Dried, compressed free of coarse materials	200-400 cu. ft.	--

TABLE 1A. GUIDE TO MULCH MATERIALS (Continued)

Mulch Material	Quality Standards	Application Rates	
		per 1000 Sq. Ft.	per Acre
Gravel, crushed stone or slag	Use clean material only.	9 cu yds.	
Twisted Kraft Paper Yarn	Plain weave, warp 7 per in., filling 4 per in. salvage edge polypropylene filament	45" x 250 yds.	Roll 100 lbs. with
Twisted Kraft Paper Yarn	Fungicide treated warp 1.1 pairs per in. filling 2.5 in.	45" x 250 yds.	Roll 80 lbs.
Twisted Yarn	Undyed, unbleached plain weave. Warp 78 ends/ yd. Weft yds. 41 ends/yd.	48" x 50 yds. or 48" x 75	Roll 60 lbs. 90 lbs.
Excelsior Wood Fiber Mats	Interlocking web of excelsior fibers with mulch net backing on one side only.	36" x 30 yds.	Roll
Glass Fiber	1/4" thick 7/16" dia. holes on 1" centers	72" x 30 yds.	Roll 56 lbs.
Plastic	2-4 mils	Variable up to 50' wide	

Jute,

TABLE 1B. GUIDE TO MULCH MATERIALS

Mulch Material	Depth of Application or Area Covered Per Unit	Remarks
Hay or Straw	Lightly cover 70 to 90 percent of surface	Use straw where mulch effect is to be maintained for more than 3 months. Subject to wind blowing unless kept moist or tied down. Widely used mulching material. Good for erosion control and establishment of seedings.
Cornstalks, Shredded or Chopped	----	Effective for erosion control, relatively slow to decompose. Excellent for mulch on crops fields. Same value as a cover crop. Resistant to wind blowing.
Compost or Manure	----	Use straw-filled manure where erosion control is needed. May create problem with weeds. Excellent moisture conserver. Resistant to wind blowing.
Wood Chips or Shavings	2-6"	Has about the same use and application as sawdust, but requires less N/ton (10-12 lbs.). Resistant to wind blowings. Can be used on critical areas if protected from washing. Decompose slowly.

TABLE 1B. GUIDE TO MULCH MATERIALS (Continued)

Mulch Material	Depth of Application or Area Cover Per Unit	Remarks
Wood Excelsior	----	Effective for erosion control. Tie-down usually not required. Decomposes slowly. Subject to some wind blowing. Packaged in 80-90 bales. Extra nitrogen fertilizer may be required.
Sawdust, Green or Composted	1-7"	Effective as a mulch around ornamentals, small fruits, and other nursery stock. Special application rates: fruit trees 5-7"; blueberries 6"; vegetables and flowers 2-3"; blackberries and raspberries 4-7"; strawberries 3". Resistant to wind blowing. Requires 30-35 lbs. N/ton to prevent N deficiency while decaying. One cu. ft. weighs 12-24 lbs.
Wood fiber Cellulose (Partly digested wood fibers)	----	When used for erosion control on critical areas double application rate. Apply by hand or hydro-mulcher. May not require tie-down.

TABLE 1B. GUIDE TO MULCH MATERIALS (Continued)

Mulch Material	Depth of Application or Area Cover Per Unit	Remarks
Peat Moss	2" - 4"	Effective as a mulch around ornamentals. Subject to wind blowing unless kept wet. Excellent moisture holding capacity.
Gravel, Crushed Stone or Slag	2" - 3"	Excellent mulch for short slopes and around woody plants and ornamentals. Use gravel where subject to foot traffic.
Twisted Kraft Paper Yarn	312.5 sq. yds.	Used to hold seed and aid in germination without mulch. Tie down according to manufacturing specifications.
Twisted Kraft Paper Yarn	312.5 sq. yds	Use over bare soil or sod to prevent erosion and hold seed. Good for waterways, critical slopes and ditch bottoms. Tie down with staples as per manufacturing specifications.
Jute, Twisted Yarn	66 sq. yds. 100 sq. yds.	Use without additional mulch. Tie down as per manufacturing specification. Effective for erosion control on critical areas, including diversions and waterways.

**TABLE 1B. GUIDE TO MULCH MATERIALS (Continued)**

<b>Mulch Material</b>	<b>Depth of Application or Area Covered Per Unit</b>	<b>Remarks</b>
Excelsior Wood Fiber Mats	30 sq. yds.	Use without additional mulch. Tie down as per manufacturing specifications. Good for establishing seedings on critical slopes.
Glass Fiber	60 sq. yds.	Use without additional mulch. Tie down with T bars as per manufacturing specifications.
Plastic	---	Use black for weed control; use clear for seeding establishment without organic mulch. Release plastic after seeding is established. Effective moisture conservation and weed control for small fruits.

TABLE 2. MULCH ANCHORING GUIDE

Anchoring Method or Material	Kind of Mulch to be Anchored	How to apply
A. <u>Manual</u>		
1. Peg and Twine	Hay or straw, pine straw	After mulching, divide areas into blocks approx. 1 sq. yd in size. Drive 4-6 pegs per block to within 2" to 3" of soil surface. Secure mulch to surface by stretching twine between pegs in cross- cross patterns on each lock. Secure around each peg with two or more turns. Drive pegs flush with soil where mowing is planned.
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2. Mulch netting	Hay or straw,  shredded sugar cane, pine straw, compost, wood shavings, 'tanbark'	Staple with light-weight or plastic nettings to paper, jute, wood fiber, soil surface according to manufacturer's recommendations.
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3. Soil and stones	Plastic	Plow a single furrow along edge of area to be covered with plastic, fold about 6" of plastic into furrow and plow furrow slice back over plastic. Use stones to hold plastic down in other places as needed.
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4. Silt	Hay or straw	Cut mulch into soil surface with square-edged spade. Make cuts in contour rows spaced 18" apart.

TABLE 2. MULCH ANCHORING GUIDE (Continued)

Anchoring Method or Material	Kind of Mulch to be Anchored	How to apply
B. <u>Mechanical</u> 1. Asphalt spray (emulsion)	Compost, wood chips, wood shavings, hay or straw.	Apply with suitable spray equipment using the following rates: asphalt emulsion 0.04 gallons per sq. yd.; liquid asphalt (rapid, medium, or slow setting) 0.10 gallons per sq. yd.
2. Wood cellulose fiber	Hay or straw	Apply with hydroseeder immediately after mulching. Use 700 lbs. wood fiber per acre.
3. Pick Chain	Hay or straw manure compost, pine straw	Use on slopes steeper than 3:1. Pull across slopes with suitable power equipment.
4. Mulch anchoring tool or disk (smooth or notched)	Hay or straw, manure compost, pine straw.	Apply mulch and pull a mulch anchoring tool over mulch. When a disk (smooth) is used, set in with straight position and pull across slope with suitable power equipment. Mulch material should be "tucked" into soil surface about 3".
5. Chemical	Hay or straw	Apply Terra Tack II (45lbs.) or Aerospray 70 (60 gal/acre) according to manufacturer's instructions. Avoid application during rain. A 24 hour curing period is required with soil temperature higher than 45 degrees F.