

**NATURAL RESOURCES CONSERVATION SERVICE**  
**CONSERVATION PRACTICE STANDARD**  
**MULCHING**

(Ac.)

**CODE 484**

**DEFINITION**

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

**PURPOSE**

This practice may be used to:

- Conserve soil moisture.
- Moderate soil temperature.
- Provide erosion control.
- Suppress weed growth.
- Establish vegetative cover.
- Improve soil condition and increase soil fertility.

**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 site conditions and the material's availability. Mulch materials shall consist of natural and/or artificial materials such as plant residue, wood bark or chips, by-products, gravel, plastic, fabric, animal manure, rice hulls, and materials from food processing plants or other equivalent materials of sufficient

dimension (depth or thickness) and durability to achieve the intended purpose for the required time period. The depth or thickness of organic mulches is related to the length of its effectiveness of its intended purpose.

Mulching is generally performed after grading, soil surface preparation, and seeding and plantings are complete. Soil surface shall be prepared in order to achieve the desired purpose.

The mulch material shall be evenly applied and 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.

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.

Mulch material shall be relatively free of disease, noxious weed seeds, and other pests and pathogens.

**Site Preparation**

Soil surface shall be prepared prior to the application of the mulch material in order to achieve desired purpose and to ensure optimum contact between soil and mulch. All areas to be mulched shall be reasonably smooth and free of rills, gullies, and debris.

Where mulch is to be placed around trees and shrubs, remove all competing vegetation and shape watering saucers as needed so they have an effective depth of four inches.

#### Materials

Mulch material, quality, rate, depth of application, and anchoring methods will be selected from **Table 1** in the practice specifications. Mulch material shall be free of disease, weed seeds, and other pests and pathogens.

#### Application

Mulch may be applied to both seeded and unseeded areas.

When applied to seeded areas, mulch shall be applied immediately after the area is seeded.

When temporary erosion control is needed, mulch may be applied anytime soil and site conditions are suitable for spreading and anchoring. Disturbed areas that will not have additional construction activity for 60 days or completed sites that will not be permanently seeded for periods of 60 days or longer should be mulched. Shorter time periods may be used depending on site conditions.

#### Anchoring

##### Mulch Anchoring Methods

Mulch Anchoring Tool or Disk (serrated blades) – Apply mulch and pull a mulch anchoring tool over mulch. Use equipment with serrated straight disks spaced six to ten inches or other suitable equipment approved by the Natural Resources Conservation Service. Operate as close to the contour as possible. Mulch material should be tucked into the soil surface two to three inches. Use on areas where concentrated flow velocity is less than four feet per second.

Wood Cellulose Fiber – Apply with a hydromulcher immediately after mulching. Reduce mulch applications to 3,000 pounds per acre and apply 750 pounds of wood fiber per acre with a non-toxic, biodegradable tackifier. Use on areas without concentrated flow.

Asphalt Spray (emulsion) – Apply with suitable equipment to spray asphalt into the mulch as it is applied. Material shall conform to the requirements of ASTM Specification D977. Application rate is 0.5 gallons per square yard (242 gallons per acre). Material shall be non-toxic to plant life. Use on areas without concentrated flow.

Tackifier or Binder – Method and rate of application shall be according to manufacturer's recommendation. Use on areas without concentrated flow.

Polypropylene Plastic Netting – Apply plastic netting over mulch and staple with 11 gauge or heavier wire staples. Use on areas without concentrated flow or when concentrated flow velocity is less than four feet per second.

Peg and Twine – After mulching, divide area into blocks approximately one square yard in size. Drive four to six pegs per block to within two to three inches of the soil surface. Anchor mulch by stretching twine between pegs in a criss-cross pattern on each block. Secure twine around each peg with two or more turns. Drive pegs flush with soil surface to allow mowing.

Slit – Cut mulch into soil surface with square edge spade. Make cuts in contour rows spaced 18 inches apart.

Soil and Stones – Bury edge of plastic in a trench six inches deep. Firm soil over plastic. Use stones to hold plastic down in other places as needed.

Manufactured mulches should be applied according to the manufacturer's specifications.

General Instructions: On slopes, mats and nets may be run either up and down or cross slope. In areas of concentrated flow, mats and nets shall be laid parallel to the direction of flow. Spread evenly without stretching to allow maximum contact with the soil. Adjacent edges should be overlapped a minimum of three inches with the upgrade mat or net on top. Staples of 11 gauge or heavier will be used to hold the mats and nets in place. Staples shall be U-shaped with a one inch crown. Staple length shall be determined by soil condition as follows: Highly compacted soils – six inches; Friable soils – eight inches; Loose or Sandy soils – ten inches. Outside edges of mats and nets shall be buried in a trench six inches deep. Mat and net edges and middles will be stapled according to manufacturer's recommendations.

#### **Additional Criteria To Conserve Soil Moisture**

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

Mulch material shall 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.

#### **Additional Criteria To Moderate Soil Temperature**

Non-porous, opaque, and dark-colored material shall be used to raise soil and ambient air temperature below the mulch. Light-colored material will be used to cool soil and ambient soil temperature below the mulch. The mulch shall be applied so

the desired soil and air temperature below the mulch can be achieved.

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 in sufficient amounts to provide 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 to a 2-inch thickness if the soil is not well-drained, and to a 3- to 4-inch thickness if drainage is good. More finely textured mulches, which allow less oxygen penetration than coarser materials, should be no thicker than 1 or 2 inches. The mulch material shall provide no greater than 80 percent ground cover in order to ensure adequate air drainage.

Gravel or other inorganic material shall be applied approximately 2 inches thick and shall consist of pieces 0.75 to 2 inches in diameter. The mulch material shall provide no more than 90 percent ground cover in order to ensure adequate air drainage.

#### **Additional Criteria To Suppress Weed Growth**

The thickness of mulch will be determined by the size of the plant being mulched. Small plants must not be smothered. 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 50 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, emergence, and disease suppression.

**Additional Criteria To Improve Soil Condition And Increase Soil Fertility**

To increase soil fertility, apply mulch materials with a carbon to nitrogen ratio (C:N) less than 30:1 such as animal manure, bio-solids, food processing wastes, or similar materials. Apply other practices such as contouring, filter strips or riparian forest buffers to assure that runoff from the mulched areas will not transport mulching materials to sensitive waterbodies. Do not apply mulch with C:N less than 20:1 to the area of designed flow in watercourses.

Credit nutrients applied with the mulch to the nutrient budget.

Use the Soil Conditioning Index to assess soil quality impacts.

**CONSIDERATIONS**

Consider 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. Increased infiltration may increase nutrient and chemical transport below the root zone. The temperature of the surface runoff may also be lowered.

Mulched soil retains moisture, requires less watering and reduces the chance of water stress on plant materials. Mulch also minimizes evaporation from the soil surface and hence reduces losses from bare soil areas.

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

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) blends the soil warming characteristics of clear mulch with the weed control ability of black mulch.

Consider potential toxic allopathic 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 mulches 3 to 6 inches away from plant stems and crowns to prevent disease and pest problems.

Deep mulch provides nesting habitat for ground-burrowing rodents that can chew extensively on bark on tree trunk and/or tree roots. Light mulch applied after the first cold weather may prevent rodents from nesting.

**PLANS AND SPECIFICATIONS**

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

- Type of mulch material used

- 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, incorporation, bio- or photo-degradation of mulch and associated 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.

Inadvertent movement of mulching or any mulching operation materials (including degraded or decomposed materials) by wind, surface or subsurface water, or mechanical means must not pose a direct or indirect cumulative environmental or safety hazard.

### REFERENCES

These publications are available at County Extension Offices; Extension Distribution Center, Printing Building, Iowa State University, Ames, IA 50011; and several are available on the ISU Publications Home page at <http://www.extension.iastate.edu/Pages/pubs/>.

- ISU Publication SUL-12, "Using Mulches in Managed Landscapes."
- ISU Publication RC-209 "Organic Mulches for Garden and Landscape Plantings."
- ISU Article FM19, "Plastic Mulch in Gardens."
- ISU Article from Yard and Garden column, "Don't Look Under the Mulch" by Donald Lewis, Extension entomologist.
- ISU Weekly Paper, "Horticultural and Home Pest News."

The following publications are available at the Iowa Conservation Partners Home page at: <http://www.ia.nrcs.usda.gov>.

- Revised Universal Soil Loss Equation (RUSLE), Section I, Erosion Prediction of the Field Office Technical Guide.

Agriculture and Agri-Food Canada. 2000. Plastic Mulches for Commercial Vegetable Production. Canada-Saskatchewan Irrigation Diversification Centre. Outlook, Saskatchewan.

Natural Resources Conservation Service. 2002. National Agronomy Manual 190-V. USDA-NRCS. Washington, D.C.

Renard, K.G., G.R. Foster, G.A. Weesies, D.K. McCool, and D.C. Yoder. 1997. Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE). U.S. Department of Agriculture, Agriculture Handbook No. 703. Pp. 175,177-179.

Shaffer, M.J., and W.D. Larson. 1987. NTQM, A Soil-Crop Simulation Model for Nitrogen, Tillage, and Crop Residue Management. U.S. Department of Agriculture, Agricultural Research Service. Conservation Research Report 34-1. Pp. 83.

Toy, Terence J., and George R. Foster, Co-editors. 1998. Guidelines for the Use of the Revised Universal Soil Loss

Equation (RUSLE) Version 1.06 on Mined Lands, Construction Sites, and Reclaimed Lands. U.S. Department of the Interior, Office of Surface Mining and Reclamation.

Wischmeier, W.H., and D.D. Smith. 1978. Predicting Rainfall Erosion Losses-A guide to Conservation Planning. U.S. Department of Agriculture, Agriculture Handbook No 537. Pp. 19, 26, 31, 50.

Wischmeier, W.H. 1974. New Developments in Estimating Water Erosion. In: Proceedings of the 29<sup>th</sup> Annual Meeting of the Soil Conservation Society of America. Syracuse, New York.

**Conservation Practice Specifications MULCHING (484)**  
**TABLE 1 – GUIDE TO MULCH MATERIALS, RATES, & USES**

Mulch Material	Quality Standards	Application Rates		Depth of Application	Anchoring Methods 1/	Remarks
		Per 1000 ft <sup>2</sup>	Per Acre			
<b>Organic Mulches</b>						
Grass hay or cereal grain straw	Air dried, free of undesirable seeds, coarse material, and moldy chunks. Grass hay should be 2/3 grass species.	75-100 lbs. 2-3 bales	1.5-2.5 tons 90-120 bales	Lightly cover 75-90 percent of the surface.	Mulch Anchoring Tool or Disk, Wood Cellulose Fiber, Asphalt Spray, Tackifier, Polypropylene Plastic Netting, Peg and Twine, Slit	Good to use where mulch is needed for up to three months. Subject to blowing unless kept moist or anchored. Most common mulching material. Good for erosion control.
Cornstalks, shredded or chopped	Air dried, 8-12" lengths.	150-300 lbs.	4-6 tons		Not required	Effective for erosion control. Slow to decompose. Excellent for mulch of crop fields. Resistant to blowing.
Sawdust or ground corncobs	Green or composted. Free of objectionable material. Hardwood sawdust is preferred. Corncobs should be free of grain.	200-300 cu ft	5 tons	2-7"	Not required	Most effective as a mulch around ornamentals, small fruits, and other nursery stock. Special application rates: Fruit trees – 5-7" Vegetables and flowers 2-3" Black & Red Raspberries 4-7" Strawberries 3"  Resistant to blowing. Requires 30-35 lbs. of N/ton to prevent N deficiency during decay. One cubic foot weighs approximately 24 pounds.

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Compost or Manure	Well shredded, free of excessive coarse material.	400-600 lbs.	8-10 tons		(Optional) Asphalt Spray or Polypropylene Plastic Netting	Use strawy manure. May create a problem with weeds. Resistant to blowing. Manure is <b>NOT</b> a good mulch for tree establishment.
Wood Excelsior	Green or air dried burred wood fibers 4" long.	90 lbs. 1 bale	2 ton		Polypropylene Plastic Netting, Peg and Twine, Slit	Effective for erosion control. Anchoring required only on critical areas or sites subject to high winds. Decomposes slowly. Packaged in 80-90 lb. bales.
Hydromulch Wood fiber cellulose (partly digested wood fiber)	Made from natural wood fiber, usually with green dye and dispersing agent added.	50 lbs.	.75-1 ton		Not required	Use maximum rate when applied to critical areas. Apply with a hydromulcher.
Hydromulch wood fiber/paper blend	Blend of natural wood fibers and paper.	50 lbs.	.75-1 ton		Not required	Use maximum rate when applied to critical areas. Apply with hydromulcher.
Wood chips or Bark shavings	Green or air dried. Free of objectionable material. Chips or shavings from hardwood species are preferred.	500-900 lbs.	10-20 tons	2-7"	(Optional) Asphalt spray, Polypropylene Plastic Netting, Peg and Twine, Slit	Same use and application as sawdust and ground corncobs. Requires 20-25 lbs. N/ton to prevent N deficiency during decay. Resists blowing.
Peat Moss	Dried, compressed, free of coarse materials.	200-400 lbs.		2-4"	(Optional) Wood Cellulose fiber	Effective around ornamentals. Keep moist to prevent blowing. Packaged in 100 lb. bales  (6 cu ft) Excellent moisture holding.

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<b>Fiber Blankets, Mats and Nettings</b>						
Excelsior wood fiber blanket	Interlocking web of excelsior wood fibers with netting on one or both sides. Eighty percent of the fibers are 6" or longer.	1.5 roll Rolls 36X36 or 48X48 2 lbs. fiber/1000 sq inch	61 rolls		See 2/ below  Staples	Use without additional mulch. Effective for erosion control on steep slopes.  Use around tree and shrub plantings to suppress weed growth. Needs to have contact w/soil to minimize rodent habitat.
Chopped straw mat	½" layer of chopped straw knitted into polypropylene netting.	1.25 rolls	51 rolls		See 2/ below	Use without additional mulch. Effective for erosion control on steep slopes. Needs to have contact w/soil to minimize rodent habitat.
Paper mat	Plastic netting interwoven with paper.	0.3 or 0.6 rolls	12 or 24 rolls		See 2/ below	Use without additional mulch. Needs to have contact w/soil to minimize rodent habitat.
<b>Inorganic Mulch</b>						
Plastic	2-4 mil	Variable up to 50 feet wide			Soil and stone	Use black for weed control. Use white for seed establishment without organic mulch. Release plastic after seeding is established. Effective moisture conservation and weed control. Large areas should have holes or slits cut to let rainfall percolate. After 4-5 years may need to remove if plastic does not degrade.
Gravel, crushed stone, or slag	Washed	9 cu yds		2-4"	Not required	Use on short slopes and around woody plants and ornamentals. Use gravel where subject to foot traffic.

1/ This column refers to the different types of mulch anchoring methods found under General Criteria.

2/ Follow Manufacturer's recommendation or see Placement and Anchoring of netting and matting located in Anchoring methods found in General Criteria.