

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

- 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.

Select mulch material using Tables 1A and 1B and mulch anchoring method using Table 2 which best meets the needs of the job.

For approved commercial materials or nettings not listed in Tables, follow manufacturer's recommendations.

Mulching is generally performed after grading, soil surface preparation and seeding and plantings are complete including installation of any surface water control measures, such as diversions, berms, terraces, etc. 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.

Select mulch material (Table 1A & 1B) and mulching method (Table 2) which best meets the needs of the job. Approved commercial mulches or nettings not listed in tables, follow 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

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service. Contact Paul Hughes, NRCS Agronomist at 207-990-9562 or email concerns to paul.hughes@me.usda.gov

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require a constant supply of moisture.

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 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 to 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, 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.

REFERENCES

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.

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.

TABLE 1A GUIDE TO MULCH MATERIALS

Mulch Material	Quality Standards	Application Rates	
		per 1000 Sq. Ft.	per Acre
Hay or Straw	Air-dried; free of undesirable seeds and coarse materials	70-90 lbs., 2 bales	1.5-2.0 T 90-100 bales
Cornstalks, Shredded or Chopped	Air-dried, shred-dried into 8" to 12" lengths	185-275 lbs.	4-6 tons
Compost or Manure	Well shredded, free of excessive coarse material	370-550 lbs.	8-12 tons
Wood Chips or Shavings	Green or air- dried. Free of objection- able coarse materials.	460-920 lbs.	10-20 tons
Wood Excelsior	Green or air-dried burred wood fibers .024" x .031" x 4"	90 lbs. (1 bale)	2 tons
Sawdust Green or Composted	Free from objectionable coarse material	83-500 cu. ft.	--
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.
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 with polypropylene filament	45" x 250 yds.	Roll 100 lbs.
Twisted Kraft Paper Yarn	Fungicide treated warp 1.1 pairs per in. filling 2.5 in.	45" x 250 yds.	Roll 80 lbs.
Jute, 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	

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 strawy manure where erosion 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)

Mulch Material	Depth of Application or Area Covered Per Unit	Remarks
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 by	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 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.
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.
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.
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>		Apply with suitable spray equipment
1. Asphalt spray (emulsion)	Compost, wood chips, wood shavings, hay or straw.	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.