United States Department of Agriculture

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

MULCHING

CODE 484

(ac)

DEFINITION

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

PURPOSE

This practice may be applied as part of a conservation management system to support 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

NRCS reviews and periodically updates conservation practice standards. To obtain the current version of this standard, contact your Natural Resources Conservation Service State office or visit the Field Office Technical Guide online by going to the NRCS website at https://www.nrcs.usda.gov/ and type FOTG in the search field.

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The type of mulching material selected shall be based on cost, time of year, soils, percent slope, anticipated runoff velocities, and landscape position.

If the area to be mulched is to be seeded, see Wisconsin NRCS Conservation Practice Standard (WI NRCS CPS) 342, Critical Area Planting.

Mulch shall consist of either natural and/or artificial materials such as plant residue including straw, grass hay, wood chips, bark and wood fiber, gravel, or other equivalent manufactured materials to achieve the intended effect for the required time period.

The mulch material shall be evenly applied and, if necessary, anchored to

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

Criteria for 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.

Concentrated flow sources above the site where mulch is applied shall be diverted, or mulch designed to withstand anticipated runoff velocities shall be used.

Criteria for Materials

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

Criteria for Application

- Mulch application applies to both seeded and unseeded areas.
- Mulch shall be applied immediately after seeding or after final grading for unseeded areas.
- The mulch material shall be evenly applied.
- Manufactured mulches should be applied according to the manufacturer's specifications.
- Crimping (disking), wood cellulose fiber, tackifiers, netting, pinning, or other acceptable methods of anchoring will be used if needed to hold the mulch in place. Criteria are described in V.B. Mulch Anchoring Methods.

Mulch Application Rate

Mulch Materias	Quality Standards	Application Rates		Depth of Application	Anchoring Method	Advantages/ Limitations
		Per 1000 ft.^{2}	per acre			
Organic Mulches						

Grass hay, small grain, straw	1. Air-dried 2. Free of undesirable seeds 3. Free of coarse material and moldy chunks 4. Grass hay should be 2/3 grass residue	75-100 lbs. or 2-3 bales	1.5-2.0 tons or 70-100 bales	Minimum surface coverage of 70% to 90% and 1 to 2 inches thick	*SEE NEXT PAGE	1. Good to use where mulch is needed up to three or more months 2. Most common mulch material used 3. Good for erosion control

Mulch Materias	Quality Standards	Application Rates		Depth of Application	Anchoring Method	Advantages/ Limitations
		Per 1000 ft.^{2}	per acre			
Organic Mulches						
Wood chips or wood bark	1. Green or air dried 2. Free of objectionable material 3. Chips or shavings from hardwood species are preferred	400- 450 lbs.	8-9 tons per acre and 80% ground cover	Minimum of 80% surface coverage	Anchoring is optional. Optional uses: Polypropylene plastic netting, peg and twine, pinning	1. Most effective as a mulch around ornamentals, small fruit and other nursery stock 2. May require 30- 40 lbs. of Nitrogen per ton of material to prevent nitrogen deficiency during decay
Wood cellulose fiber mulch	Made from natural wood fiber	50 lbs.	¾ ton to 1 ton	N/A	Anchoring is not required unless slopes exceed 3:1	1. Must apply with Hydro-mulcher 2. May be used to tack straw mulch
* Options for anchoring may include: 1.) Mulch anchoring tools or serrated disk to embed mulch 2-3 inches deep, 2.) Wood cellulose fiber (when used reduce hay or straw to a rate of 3000 lbs. per acre and wood cellulose fiber to 750 lbs./ac.), 3.) Nontoxic binding material (tackifier, soil stabilizer, etc.). Spray uniformly to mulch material. Rates shall be applied according to the manufacturer's recommendations, 4.) Polypropylene plastic or jute netting; applied over mulch according to manufacturer's recommendations. Note: Straw mulch should be stabilized to prevent mulch from being transported by wind or water.						

Mulch Materials	Quality Standard	Application Rates		Depth of Application	Anchoring Method	Advantages/ Limitations
		per 1000 ft.^{2}	per acre			
Fiber Blankets, Mats and Nettings*						
Excelsior wood fiber blanket	1. Interlocking web of excelsior wood fibers 2. 80% of fibers are 6" or longer	Cover area requiring protection.		N/A	** Follow manufacturer's recommendation for placement and anchoring of netting/matting specifications. Generally anchored at 6 inch spaces on heavy soils, 8 inches on friable soils, and 10 inches on sandy soils.	1. Intended for use in high water velocity conditions. 2. Used without additional mulch. 3. Effective for erosion control on steep slopes. 4. Can be used around tree and shrub plantings to suppress weed growth. 5. Must have good contact with the soil to minimize rodent habitation.
Chopped straw mat	½" layer of chopped straw knitted into polypropylene netting	See manufacturer's recommendation for placement and anchoring of netting/ matting specifications. 1.25 rolls per 1000 square feet or 55 rolls per acre or cover entire area to be protected.		N/A	** Follow manufacturer's recommendation for placement and anchoring of netting/matting specifications.	1. Effective on steep slopes. 2. No additional mulch needed.

Mulch Materials	Quality Standard	Application Rates		Depth of Application	Anchoring Method	Advantages/ Limitations
		per 1000 ft.^{2}	per acre			
Fiber Blankets, Mats and Nettings*						

Paper mat	Plastic netting interwoven with paper	See manufacturer's recommendation for placement and anchoring of netting/ matting specifications. Cover area to be protected.	N/A	** Follow manufacturer's recommendation for placement and anchoring of netting/matting specification.	Additional mulch is not necessary.
* On slopes, matting and/or netting placement/orientation is allowed up and down or perpendicular to the slope. In areas of concentrated flows, mats and nets shall be laid parallel to the direction of flow and spread evently without stretching to allow maximum contact with the soil. Adjacent edges should overlap a minimum of 3 inches with the adjoining mat or net, or according to manufacturer's recommendations.					

Mulch Materials	Quality Standards	Application Rates		Depth of Application	Anchoring Method	Advantages/ Limitations
		per 1000 ft.^{2}	per acre			
Inorganic Mulch						
Polypropylene plastic Use degradable net (WI DOT Class I Type A, Class II Type C)	2-4 millimeters.	Variable up to 50 ft. wide.		N/A	Soil and stones Do not use where concentrated flow exists	1. Use black for weed control 2. Effective for moisture conservation 3. Large areas should have slits or holes to let rainfall percolate 4. May need to remove if plastic does not degrade
Gravel	1. Washed 2. ¾ to 2" in diameter	8 cubic yds. per 1000 ft.2		3/4 to 2-inch deep and 90% ground coverage	N/A	Use on short slopes 1. Use around woody plants and ornamentals 2. Use in areas subject to heavy traffic

Mulch Anchoring

- 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 and spread evenly without stretching to allow maximum contact with the soil.
- Adjacent edges should be overlapped a minimum of 3 inches with the adjoining mats or nets or according to manufacturer's recommendations.
- Staples of 11 gauge or heavier will be used to hold the mats and nets in place. Staples shall be U- shaped with a 1-inch crown.
- Staple length shall be determined based on soil condition.

Soil Condition	Staple Length
Highly compacted soils	6 inches
Friable soils	8 inches
Loose or sandy soils	10 inches

- Lay downstream blankets first, working upstream. The netting side of the blanket shall be on the top side after installation. Mat and net edges and middles will be stapled according to manufacturer's recommendations.

Peg and Twine

- After mulching, divide the area into blocks approximately one square yard in size.
- Drive 4 to 6 pegs per block to within 2 to 3 inches of the soil surface. Anchor mulch by stretching twine between pegs in a crisscross pattern on each block. Secure twine around each peg with two or more turns. Drive pegs flush with soil surface to allow mowing. Use on areas without concentrated flow.

Trenching or Weights

- Bury upper edge of plastic in a trench 6 inches deep. Compact the soil over plastic in the trench. Use stones to hold plastic down in other places as needed. Use on small areas without concentrated flow.

Pinning

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Soil

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Cut mulch into soil surface with square edge spade or a dull disk. Make cuts in contour rows. Use on small areas without concentrated flow.

Small areas of mulch can be lightly covered with soil. The soil shall be free of stones and debris, and distributed over the mulch in a thin uniform layer. Use on small areas without concentrated flow.

Additional Criteria to Conserve Soil Moisture and Reduce Energy Use Associated with Irrigation Mulch material applied to the soil surface shall cover at least 60 percent of the soil surface to reduce potential evaporation.

Additional Criteria to Provide Erosion Control and to Reduce Airborne Particulates

Mulch rate shall be determined using current erosion prediction technology to reach the soil conservation objective.

Nonporous, clear, infrared transmissible, 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 to the desired soil and air temperature below the mulch can be achieved.

Additional Criteria to Facilitate the Establishment of 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 allow adequate light and air penetration to the seedbed to ensure proper germination and emergence planting.

Additional Criteria to Improve Soil Health

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. Mulch material with a C:N of less than 20:1 shall not be applied to an area of designed flow in watercourses.

The Soil Conditioning Index (SCI) shall be computed to assess soil quality impacts and to determine the type and rate of the mulching material for use. The computed SCI shall be of a positive value.

CONSIDERATIONS

Additional recommendations relating to design that may enhance the use of, or avoid problems with, this practice but are not required to ensure its basic conservation functions are as follows:

- Consider mulching 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.
- Consider mulching of 100 percent of the treatment area.
- Consider application of mulch immediately after a precipitation event or watering to conserve soil moisture. Ensure soil under shallow rooted crops is moist, as these crops require a constant supply of moisture.
- Consider anchoring straw or hay mulch or keep mulch moist to prevent blowing in wind- prone areas.
- Consider the impact of mulch materials with a high water holding capacity and/or high impermeability to water droplets which may reduce the water

availability to plants.

- Consider the potential of organic materials with C:N ratios of less than 20:1 to release reduce nitrogen to adjoining surface waters.
- Consider the potential for mulch to provide habitat for beneficial insects and provide pest suppression.
- Consider the mulch color impact on plant growth. Clear mulches allow profuse weed growth and may negate the benefits of soil warming. Black mulches provide effective weed control.
- Consider the potential for runoff from low permeability mulches (e.g., plastic) which may increase concentrated flow and erosion on un-mulched areas.
- Consider the potential for mulch to cause disease and pest problems. Keep mulch 3 to 6 inches away from plant stems and crowns where an identified risk is present. Additional weed control may be needed around the plant base area.
- Consider the potential for deep mulch to provide nesting habitat for ground-burrowing rodents that can chew extensively on tree trunks and/or tree roots. Use of a light mulch applied after the first cold weather may prevent rodents from nesting.
- Consider the use of biodegradable staples in locations where wire staples are determined to be a risk.

PLANS AND SPECIFICATIONS

The purpose, plans and specifications shall be prepared for each site. The information shall be recorded on specification sheets, WI Job Sheet 484 Mulching, in the conservation plan record of decisions or other acceptable means of documentation.

Documentation shall include the following:

- Conservation plan map of all sites;
- purpose of the mulch;
- type of mulch material used;
- percent cover and/or thickness of mulch material;
- rate of mulch application (tons/acre, lbs. / square foot);
- 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 as necessary after use 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.

FEDERAL, TRIBAL, STATE, AND LOCAL LAWS

Users of this standard should be aware of potentially applicable federal, tribal, state and local laws, rules, regulations, or permit requirements governing field borders. This standard does not contain the text of federal, tribal, state, or local laws.

REFERENCES

Agriculture and Agri-Food Canada. 2000. Plastic mulches for commercial vegetable production. Canada- Saskatchewan Irrigation Diversification Centre. Outlook, Saskatchewan.

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USDA, NRCS. 2002. National Agronomy Manual. 190-V.

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