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. Mulch material, quality, rates, depth of application, and anchoring methods will be selected from **Table 1**. Manufactured mulches shall be applied and anchored according to the manufacturer's specifications.

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service State Office or visit the Field Office Technical Guide.

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 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

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.

REFERENCES

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Toy, T.J., and G.R. Foster. (Ed.) 1998. Guidelines for the use of the Revised Universal Soil Loss Equation (RUSLE) Version 1.06 on mined lands, construction sites, and reclaimed lands. USDI, OSMR.

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NRCS, Illinois

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TABLE 1 – GUIDE TO MULCH MATERIALS, RATES, & USES

Mulch Material	C:N Ratio	Quality Standards	Application Rates	Anchoring Methods	Remarks
Grass hay Cereal grain straw	15-32 48-150	Air-dried, free of undesirable seeds, course material and moldy chunks. Grass hay should be 2/3 grass species	Area Covered (%) / lb./ac / lb./1000 ft^2 60 / 1600 / 37 70 / 2600 / 60	• Mulch Anchoring Tool or Disk, • Wood Cellulose Fiber, • Asphalt Spray Tackifier, • Polypropylene Plastic Netting, • Peg & Twine • Slit	Good to use where mulch is needed for up to 3 months. Subject to blowing unless kept moist or anchored. Most common mulching material. Good for erosion control
Cornstalks(shredded or chopped)	60-73	Air dried, 8-12" lengths	Area Covered (%) / lb./ac / lb./1000 ft^2 60 / 2400 / 55 70 / 4000 / 92		
Sawdust (442 lbs/yd^3) Or Ground corn cobs (557 lbs/yd^3)	56-123 200-750	Green or composted. Free of objectionable material. Hardwood sawdust is preferred. Corncobs should be free of grain	• Fruit trees – 5-7" • Vegetables and flowers 2-3" • Black & Raspberries 4-7" • Strawberries 3"		Most effective as mulch around ornamentals, small fruits and other nursery stock. Requires 30-35 lbs. of N/ton to prevent N deficiency. Walnut sawdust is not recommended
Manure	3-50		Area Covered (%) / lb./ac / lb./1000 ft^2 60 / 1400 / 32 70 / 2300 / 53		Manure with bedding is preferred. Manure may be a source of weeds. Resistant to blowing.

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Mulch Material	C:N Ratio	Quality Standards	Application Rates	Anchoring Methods	Remarks
Wood Excelsior	NA	Green or air dried burred wood fibers 4"long.	Area Covered (%) / lb./ac / lb./1000 ft^2 60 / 1600 / 37 70 / 2600 / 60	• Polypropylene Plastic Netting, • Peg & Twine, • Slit	Effective for erosion control. Anchoring required only on critical areas or sites subject to high winds. Decomposes slowly.
<u>Hydromulch</u> Wood fiber cellulose (partly digested wood fiber) or wood fiber/paper blend	NA	Cellulose made from natural wood fiber, usually with green dye and dispersing agent added; blend is of natural wood fibers and paper.	Use maximum rate specified according to manufacturer's instructions.		Apply with hydromulching equipment.
Wood chips (445-620 lbs/yd^3) Or Bark shavings	451-819	Green or air-dried. Free of objectionable material. Chips or shavings from hardwood species are preferred. Note: Walnut chips or shavings are not recommended.	Area Covered (%) / lb./ac / lb./1000 ft^2 60 / 4800 / 110 70 / 6500 / 150		Same use and application as sawdust and ground corncobs. Requires 20-25 lbs. N/ton to prevent N deficiency during decay. Resists blowing.
Excelsior wood fiber blanket	NA	Interlocking web of excelsior wood fibers. Netting on one or both sides. 80% of the fibers 6 inches or longer. **2 lbs. fiber per 1000 in^2**	Calculate based on the size of the rolls plus the manufacturer specified overlap.	• staples	Use without additional mulch. Effective for erosion control on steep slopes. Use around tree and shrub plantings to suppress weed growth.

Cereal grain straw		
Area Covered (%)	lb./ac	lb./1000 ft^2
60	1600	37
70	2600	60
90	3900	90
Wood chips		
Area Covered (%)	lb./ac	lb./1000 ft^2
60	4800	110
70	6500	150
90	9000	207
Manure, solid, significant bedding		
Area Covered (%)	lb./ac	lb./1000 ft^2
60	1400	32
70	2300	53
90	3400	80
Corn stalks		
Area Covered(%)	lb./ac	lb./1000 ft^2
60	2400	55
70	4000	92
90	6100	140