

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

MULCHING

(Ac.)

CODE 484



Up-close picture of wood chip mulch

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 (resource concern in parenthesis):

- Conserve soil moisture – (INSUFFICIENT WATER –Inefficient moisture management).
- Reduce energy use associated with irrigation – (INEFFICIENT ENERGY USE – Farming/ranching practices and field operations and INSUFFICIENT WATER –Inefficient moisture management).
- Provide erosion control – (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).
- Reduce airborne particulates – (AIR QUALITY IMPACTS - Emissions of Particulate Matter - PM - and PM Precursors).
- Facilitate the establishment of vegetative cover – (DEGRADED PLANT CONDITION – Undesirable plant productivity and health).
- Improve soil health – (SOIL QUALITY DEGRADATION –Organic matter depletion).

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](#).

CONDITIONS WHERE THIS 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 Stated Above**

The selection of mulching materials depends primarily on purpose(s) for the mulch application, site conditions, and the material's availability. Mulch materials can be natural and/or artificial as long as they are of sufficient dimension (depth or thickness) and durability to achieve the intended purpose for the required time period.

The type of soil surface preparation required is dependent on the desired purpose. Mulching is generally performed after grading, soil surface preparation, and seeding and plantings are complete. Polyethylene mulches are applied after grading and soil preparation, but before planting.

Apply mulch material evenly and, if necessary, anchor it to the soil. Tackifiers, emulsions, pinning, netting, crimping, or other acceptable methods of anchoring can 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, take appropriate measures to protect the furrows.

Mulch material needs to be of a quality to meet the intended purpose. At a minimum, apply manufactured mulches according to the manufacturer's specifications.

Mulching operations need to comply with federal, state and/or local laws and regulations during the installation, operation, and maintenance of the practice.

Additionally, mulch material need to be free of noxious weed seeds or other propagules (see the Florida Exotic Pest Plant Council, <http://www.fleppc.org/list/list.htm>) and relatively free of other weed seeds, disease, pesticides, chemicals, and other pests and pathogens.

Avoid or minimize to the extent practical impact to cultural resources, wetlands, and Federal and State protected species during planning, design and implementation of this conservation practice. For more information, see National and Florida NRCS policy, [General Manual \(GM\) Title 420-Part 401, Title 450-Part 401, and Title 190-Parts 410.22 and 410.26](#); National Planning Procedures Handbook (NPPH, [Handbooks Title 180 Part 600](#)) FL Supplements to Parts 600.1 and 600.6; National Cultural Resources Procedures Handbook (NCRPH, [Handbooks Title 190 Part 601](#)); and The National Environmental Compliance Handbook (NECH, [Handbooks Title 180 Part 610](#)).

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

To significantly reduce potential evaporation, at least 60 percent of the soil surface needs to be covered with mulch materials.

At this level of surface cover, a more uniform soil moisture regime is maintained and the frequency of irrigation is reduced. Mulching does not remove the need for irrigation, and even when using this conservation practice, producers need to be provided with an irrigation water management plan developed in accordance with Florida NRCS Conservation Practice Standard, [Irrigation Water Management, Code 449](#).

Additional Criteria to Provide Erosion Control and to Reduce Airborne Particulates

The amount of mulch coverage required is based on the erosion control objective as determined by current erosion prediction technology.

When mulching with cereal grain straw or grass hay, at a minimum apply enough material to provide 70 percent ground coverage.

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

When mulching with gravel or other inorganic material, mulch pieces need to be between 0.75 and 2 inches in diameter and applied at a minimum of 2 inch thickness.

Additional Criteria to Establish Vegetative Cover

For this purpose, a minimum of 70 percent ground cover with mulch is required. At this rate, the soil surface is protected from erosion and runoff, and adequate light and air penetration is allowed to the seedbed to ensure proper seedling and transplant establishment and growth.

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 30:1 so that soil nitrogen is not immobilized by soil biota. Do not apply mulch with C:N less than 20:1 to the area of designed flow in watercourses. See NRCS National Engineering Handbook [Appendix 2](#) for C:N ratios of common agricultural material.

Use the Soil Conditioning Index (SCI) to assess soil quality impacts and to determine the type and rate of the mulching material. Select type and amount that will produce a SCI of zero (neutral) or positive is required.

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 when used.

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.

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 get the soil too hot. Black mulches provide effective weed control. Wavelength selective (IRT) plastic provides the soil warming characteristics

of clear mulch with the weed control ability of black mulch. Plastic mulches can be covered with a layer of mulch such as wood chips or pine needles to reduce heat absorption or to mask the artificial appearance of the plastic film.

Plastic films are not recommended for poorly-drained areas. They may cause the soil to remain too wet, which could result in root disease problems. They are also not suited for steep slopes when organic mulch is spread over the plastic, because rain water will wash the organic mulch away. Additionally due to their low permeability, plastic may increase concentrated flow and erosion on un-mulched areas.

Mulching may also provide habitat for beneficial insects 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. 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.

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.

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.

Light-reflecting mulches such as white or aluminized plastic film or bright straw can repel some pests. Highly reflective silver or metalized coatings on polyethylene have become important in North Florida and South Georgia as a method of reducing tomato spotted wilt virus in tomatoes. These mulches repel the western flower thrips, (*Frankliniella occidentalis*) and the tobacco thrips (*F. fusca*), which are the vectors for the tomato spotted wilt virus.

Keep mulches 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 bark on tree trunk 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 \(NOP\)](#) regulations.

PLANS AND SPECIFICATIONS

Specifications need to be prepared for each site and purpose and recorded using approved implementation requirement documents.

Documentation should include:

- Purpose of the mulch
- 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

Periodically inspect mulched areas and reinstall or repair mulch 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 needs to be consistent with the intended purpose and site conditions.

Do not compromise the intended purpose of the mulch when operating of equipment near or on the site (e.g., don't damage plastic mulch with tillage or spray equipment).

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

University F-IFAS Fact Sheet ENH 103 – Mulches for the Landscape

Olson, S.M. 2011. Chp. 6. Mulching. Dep. Hort. Sci., Univ. Florida, Inst. Food Agric. Sci. HS715. 4 p.

[Hochmuth, G.J., R.C. Hochmuth, and S.M. Olson. 2008. Polyethylene Mulching for Early Vegetable Production in North Florida. Univ. Florida, Inst. Food. Agric. Sci., Agric. Exten. Cir. 805. 6 p.](#)

[National Organic Program – Subpart C; Section 205.206](#)

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

[Renard, K.G., G.R. Foster, G.A. Weesies, D.K. McCool, and D.C. Yoder, Coordinators. 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.](#)

Shaffer, M.J., and W.E. Larson (ed.). 1987. NTRM, a soil-crop simulation model for nitrogen, tillage and crop residue management. USDA Conserv. Res. Rep. 34-1. USDA-ARS.

[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.](#)

[USDA, NRCS. 2011. National Agronomy Manual. 190-V. 4th ed.](#)