

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD AND SPECIFICATIONS**

**RESIDUE AND TILLAGE MANAGEMENT
MULCH TILL
(Acre)**

CODE 345

DEFINITION

Managing the amount, orientation, and distribution of crop and other plant residues on the soil surface year round while limiting the soil-disturbing activities used to grow crops in systems where the entire field surface is tilled prior to planting.

PURPOSES

This practice may be applied as part of a conservation system to support one or more of the following:

- Reduce sheet and rill erosion.
- Reduce wind erosion.
- Reduce soil particulate emissions
- Maintain or improve soil condition.
- Increase plant-available moisture.
- Provide food and escape cover for wildlife.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cropland and other land where crops are grown.

This practice includes tillage methods commonly referred to as mulch tillage or chiseling and disking. It applies to stubble mulching on summer fallowed land, to tillage for annually planted crops, and to tillage for planting perennial crops.

It also includes some planting operations such as hoe drills, air seeders, and no till drills that disturb a large percentage of the soil surface during the planting operation.

CRITERIA

General Criteria Applicable to All Purposes

Loose residues to be retained on the field shall be uniformly distributed on the soil surface.

Residues shall not be burned.

Implements shall be equipped to operate through plant residues without clogging and to maintain residue on or near the soil surface by undercutting and mixing.

Planters, drills, and other seeders shall be equipped to plant in residue distributed on or near the soil surface or mixed in the tillage layer.

The number, sequence, and timing of tillage and planting operations and the selection of ground-engaging equipment shall be managed to achieve the planned amount, distribution, and orientation of residue after planting or at other essential time periods.

The soil tillage intensity rating (STIR) shall be equal to 60 or less for the established rotation. All field operations that affect the surface residue will be included in the calculation to determine the STIR value for the planned or existing rotation.

Additional Criteria to Reduce Sheet and Rill Erosion

The amount of randomly distributed surface residue needed and the amount of surface soil disturbance allowed to reduce erosion to the planned soil loss objective shall be determined using the current approved water erosion prediction technology. Calculations shall account for the effects of other practices used in the management system.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service or download the standard from the [electronic Field Office Technical Guide](#) for Missouri

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Partial removal of residue by means such as baling or grazing shall be limited to retain the amount of residue needed for erosion control.

Tillage operations shall be limited to methods that leave adequate residue on the soil surface and maintain the planned cover conditions.

Additional Criteria to Reduce Wind Erosion

The amount and orientation of residue needed and the amount of surface soil disturbance allowed to reduce erosion to the planned soil loss objective shall be determined using the current approved wind erosion prediction technology. Calculations shall account for the effects of other practices in the management system.

Partial removal of residue by means such as baling or grazing shall be limited to retain the amount of residue and orientation needed for erosion control.

Tillage operations shall be limited to methods that leave adequate residue on the soil surface and maintain the planned cover conditions.

Additional Criteria to Reduce Soil Particulate Emissions

The amount and orientation of residue needed and the amount of surface soil disturbance allowed to reduce wind erosion to the tolerable soil loss value (T) shall be determined using the current approved wind erosion prediction technology. Calculations shall account for the effects of other practices in the management system.

Additional Criteria to Maintain or Improve Soil Condition

An evaluation of the residue and tillage management system using the current approved soil conditioning index procedure shall result in a positive trend. Partial removal of residue by means such as baling or grazing shall be limited to retain the amount needed for the desired soil condition. Calculations shall account for the effects of other practices in the conservation system.

Additional Criteria to Increase Plant-Available Moisture

A minimum of 2000 pounds per acre or 60 percent surface residue cover shall be maintained throughout the year. Residue shall be evenly distributed and maintained on the soil surface. Partial removal of residue by means such as baling or grazing shall be limited to retain the minimum amount needed to conserve soil moisture.

Additional Criteria to Provide Food and Escape Cover for Wildlife

The time that residue is present, the amount and orientation of residue, and the height of stubble needed to provide adequate food and escape cover for the target species shall be determined using an approved habitat evaluation procedure.

Residues shall not be removed unless it is determined that residue removal would not adversely affect habitat values. Stubble shall remain standing over winter. Tillage shall be delayed until spring to maintain waste grain on the soil surface through the winter.

CONSIDERATIONS

General – Removal of crop residues, such as by baling or grazing, can have a negative impacts on resources. These activities should not be performed without a full evaluation of the impacts on soil, water, animal, plant, and air resources.

Mulch till may be practiced continuously throughout the crop sequence or may be managed as part of a residue management system that includes other tillage methods such as no till. Select acceptable tillage methods for specific site conditions.

Production of adequate amounts of crop residues necessary for the proper functioning of this practice can be enhanced by the selection of high residue crops and crop varieties in the rotation, use of cover crops, and adjustments to plant populations and row spacing.

Straw choppers and chaff spreaders are valuable attachments for all combines particularly when harvesting high yielding crops. When combines

are equipped with a stripper header, only a chaff spreader is desired.

Increasing Soil Organic Matter Level and Reducing Carbon Dioxide Loss from the Soil -

Where improving soil tilth is a concern, use of undercutting implements will enhance the accumulation of organic material in the surface layer.

Carbon dioxide loss is directly related to the volume of soil disturbed, the intensity of the disturbance, and the soil moisture content and soil temperature at the time the disturbance occurs. The following guidelines can make this practice more effective:

- shallow soil disturbances (1 to 3 inches) release less carbon dioxide than deeper operations;
- when deep soil disturbance is performed, such as subsoiling or fertilizer injection, make sure the vertical slot created by these implements is closed at the surface;
- planting with a single disk opener no-till drill will release less carbon dioxide than planting with a wide-point hoe or chisel opener air seeder drill; and
- soil disturbances that occur when soil temperatures are below 50^o F will release less carbon dioxide when the soil is warmer.

Increasing Plant-Available Moisture - The effectiveness of stubble to trap snow or reduce plant damage from freezing or desiccation increases with stubble height. A minimum stubble height of 10 inches is desired.

Patterns of variable stubble heights may be created to further increase snow storage.

Tillage and planting operations completed on the contour will help slow overland flow and increase infiltration thus increasing the potential for increased water storage in the root zone.

Providing Food and Escape Cover for Wildlife

– Avoid disturbing standing stubble or heavy residue during the nesting season for ground-nesting species.

Avoiding fall shredding or tillage operations will maximize the amount of wildlife food and cover during critical winter months.

Leaving rows of unharvested crop standing at intervals across the field or adjacent to permanent cover will enhance the value of residues for wildlife food and cover. [Leaving unharvested crop rows for two growing seasons will further enhance the value of these areas for wildlife.](#)

PLANS AND SPECIFICATIONS

Specifications for establishment and maintenance of this practice shall be prepared for each field or treatment unit according to the Criteria, Considerations, and Operation and Maintenance described in this standard.

Site specifications shall be recorded using approved specification sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation.

OPERATION AND MAINTENANCE

No specific operation and maintenance requirements have been identified for this practice.

REFERENCES

Bolton, Ryan. 2003. Impact of the surface residue layer on decomposition, soil water properties, and nitrogen dynamics. M.S. Thesis. University of Saskatchewan, Saskatoon, Saskatchewan, CA.

Reicosky, D.C., M.J. Lindstrom, T.E. Schumacher, D.E. Lobb, and D.D. Malo. 2005. Tillage-induced CO₂ loss across an eroded landscape. *Soil Tillage Res.* 81:183-194.

Reicosky, D.C. 2004. Tillage-induced soil properties and chamber mixing effects on gas exchange. Proc. 16th Triennial Conference, Int. Soil Till. Org. (ISTRO).

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.

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

Skidmore, E.L. and N.P. Woodruff. 1968. Wind erosion forces in the United States and their use in predicting soil loss. U.S. Department of Agriculture. Agriculture Handbook No. 346.

USDA Natural Resources Conservation Service. 2002. National Agronomy Manual. 190-V. 3rd ed.