

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
RESIDUE AND TILLAGE MANAGEMENT**

MULCH TILL

(Ac.)

CODE 345

DEFINITION

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

PURPOSE

Reduce sheet and rill erosion.

Reduce wind erosion.

Maintain or improve soil quality.

Increase plant-available moisture.

Reduce energy use.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cropland.

This practice includes tillage methods commonly referred to as mulch tillage where a majority of the soil surface is disturbed by tillage operations such as vertical tillage, chiseling and disking and also includes tillage/planting systems with relatively minimal soil disturbance but which do not meet the criteria for Residue and Tillage Management (No Till/Strip Till/Direct Seed (329). 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 that disturb a large percentage of

the soil surface during the planting operation and cropping systems in which the majority of surface area is disturbed during harvest operations.

CRITERIA

General Criteria Applicable to All Purposes

Surface residues shall be uniformly distributed over the entire field.

Residue shall not be burned.

Additional Criteria to Reduce Sheet and Rill Erosion and Reduce Wind Erosion

The amount and orientation of surface residue and the amount of surface soil disturbance required to reduce erosion to the planned soil loss objective shall be determined using current NRCS approved water and/or wind erosion prediction technology.

Calculations shall account for the effects of other conservation practices in the management system.

The Revised Universal Soil Loss Equation (RUSLE2) is the current SD-NRCS approved erosion prediction technology for sheet and rill erosion.

http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm

The Wind Erosion Prediction System (WEPS) is the current SD-NRCS approved erosion prediction technology for wind erosion.

<http://www.weru.ksu.edu/nrcs/wepsnrcs.html>

Additional Criteria to Maintain or Improve Soil Quality

The Soil Conditioning Index (SCI) procedure contained in the RUSLE2 and WEPS models shall result in a positive trend for the planned crop rotation.

The Soil Tillage Intensity Rating (STIR) for each crop interval during the planned rotation shall be no greater than 80.

Erosion calculations shall account for the effects of other conservation practices in the management system.

Additional Criteria to Increase Plant-Available Moisture

Reducing Evaporation: A minimum of 60 percent surface residue cover throughout the year shall be maintained.

Trapping Snow. Fall tillage operations shall leave the crop stubble in an upright position.

Maintain a crop stubble height during the time significant snowfall is expected to occur to:

- at least 10 inches for crops with a row spacing of less than 15 inches;
- at least 15 inches for crops with a row spacing of 15 inches or greater;
- Maintain these heights over at least 50 percent of the field.

Conduct fall tillage operations, as close as possible, perpendicular to the direction of prevailing winds during the time that significant snowfall is expected to occur.

Additional Criteria to Reduce Energy Use

The average annual STIR value for the planned crop rotation shall be no greater than 85 percent of the average annual STIR for the Benchmark crop rotation.

The diesel fuel equivalent use for the planned crop rotation shall be no greater than 85 percent of the diesel fuel equivalent use estimate for the benchmark crop rotation.

The RUSLE2 field operation database shall be used to document diesel fuel equivalent values for all field operations.

CONSIDERATIONS

General. Removal of crop residue, such as by burning, baling or grazing, can have a negative impact on resources. These activities should not be performed without full evaluation of 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. Selection of acceptable tillage methods for specific site conditions may be aided by an approved Soil Tillage Intensity Rating (STIR).

Energy savings in fuel used can be estimated using NRCS approved energy software or other software to determine the impact of alternative tillage systems.

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

A field border (see 386) planted to permanent vegetation can:

- allow unobstructed turning for equipment;
- eliminate unproductive end rows;
- provide food and escape cover for wildlife;
- provide travel lanes for farming operations;
- provide habitat for beneficial insects and pollinators.

When providing technical assistance to organic producers, residue management, and tillage activities should be consistent with the USDA - Agricultural Marketing Service National Organic Program standard.

Increasing Soil Organic Matter Level and Reducing CO₂ Loss from the Soil – Where improving soil tilth is a concern, use of undercutting tools will enhance accumulation of organic material in the surface layer.

CO₂ 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 disturbance (1-3 inches) releases less CO₂ than deeper operations.

When deep soil disturbance is performed, such as by subsoiling or fertilizer injection, make sure the vertical tillage slot created by these implements is closed at the surface.

Planting with a single-disk opener no-till drill will release less CO₂ than planting with a wide-point hoe/chisel opener air seeder drill.

Soil disturbance that occurs when soil temperatures are below 50°F will release less CO₂ than operations done when the soil is warmer.

Increasing Plant-available Moisture – The effectiveness of stubble to trap snow increases with stubble height. Increasing the stubble height beyond the minimum required will increase the amount of snow trapped.

Variable height stubble patterns may be created to further increase snow trapping and storage.

Tillage and planting operations done 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 tillage and other soil and residue/stubble disturbing operations during the nesting season and brood-rearing period for ground-nesting species

Forgoing 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.

An approved habitat evaluation procedure will aid in determining the appropriate time and amount of residue and stubble needed to provide adequate food and cover for the target wildlife species.

PLANS AND SPECIFICATIONS

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

Practice specifications shall include:

- Planned crops and yields in the rotation;
- Management record of the sequence and description of planned field operations;
- Crop interval STIR values during the rotation.
- Soil erosion estimates and soil Conditioning Index values for the crop rotation.

Specify the planned surface residue amounts:

- (1) after harvest of the prior crop; and
- (2) after seeding of the planned crop.

Plan specifications shall be recorded using approved practice specification sheets and additional documents listed as Documentation Requirements for this conservation practice (SD-DR-345).

OPERATION AND MAINTENANCE

Evaluate the crop residue amounts and orientation following each crop interval to

ensure the planned level of resource protection is maintained.

Adjust the planned residue and tillage management for the crop system as needed to ensure the practice purposes, criteria, and plan objectives are maintained.

REFERENCES

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