

USDA  
NATURAL RESOURCES  
CONSERVATION SERVICE

MARYLAND CONSERVATION  
PRACTICE STANDARD

**RESIDUE AND TILLAGE  
MANAGEMENT,  
MULCH-TILL**

CODE 345  
(Reported by Acre)

**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 crops in systems where the entire field surface is tilled prior to planting.

**PURPOSE**

This practice may be applied for one or more of the following purposes:

1. To reduce sheet and rill erosion;
2. To reduce wind erosion;
3. To reduce soil particulate emissions;
4. To maintain or improve soil condition;
5. To increase plant-available moisture;
6. To provide food and escape cover for wildlife.

**CONDITIONS WHERE PRACTICE  
APPLIES**

This practice is applicable on cropland and on other land uses where crops are planted.

This practice includes tillage methods commonly referred to as mulch tillage, or chiseling and

disking, for annually planted crops and for planting perennial crops. Additional specialized tillage equipment may be used to achieve the benefits of this practice.

**CONSIDERATIONS**

**General**

“Mulch-till” refers to full-width tillage involving one or more tillage trips which disturbs all of the soil surface and is done prior to and/or during planting. Tillage tools such as chisels, field cultivators, disks, sweeps or blades are used.

Mulch till may be practiced continuously throughout the crop sequence. Mulch till can also include no-till methods in the rotation. Selection of acceptable tillage methods for specific site conditions may be aided by an approved Soil Tillage Suitability Rating.

Removal of plant residue, such as by 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.

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.

**Increasing Soil Organic Matter Level and  
Reducing CO<sub>2</sub> 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.

CO<sub>2</sub> 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. Consider the following guidelines to make this practice more effective:

1. Shallow soil disturbance (1-3 inches) releases less CO<sub>2</sub> than deeper operations;

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

2. When deep soil disturbance is performed, such as by subsoiling or fertilizer injection, make sure the vertical slot created by these implements is closed at the surface;
3. Planting with a single disk opener no-till drill will release less CO<sub>2</sub> than planting with a wide-point hoe/chisel opener air seeder drill;
4. Soil disturbance that occurs when soil temperatures are below 50° F will release less CO<sub>2</sub> than operations done when the soil is warmer.

#### **Increasing Plant-Available Moisture**

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**

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

Leaving rows of unharvested crops standing at intervals across the field or adjacent to permanent cover will enhance the value of residues for wildlife food and cover.

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

### **CRITERIA**

#### **General Criteria Applicable to All Purposes**

All residues shall be uniformly distributed over the entire field.

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

To reduce erosion, use high residue producing crops as often as possible. The amount of randomly distributed surface residue needed and the amount of surface soil disturbance allowed to reduce erosion to the tolerable soil loss value (T) shall be determined using the current approved erosion prediction technology.

Minimum residue requirements for this practice will be reflected by leaving all crop residues from

row crops on the field following harvest. When residues such as corn stalks or soybean residue are removed, a cover crop will be used to supplement cover lost from residue removal. 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 cropping system using the current approved soil conditioning index (SCI) procedure shall result in a positive value.

#### **Additional Criteria to Increase Plant-Available Moisture**

To reduce evaporation from the soil surface, a minimum of 2,000 pounds per acre, or 60 percent surface residue cover, shall be maintained throughout the year.

#### **Additional Criteria to Provide Food and Escape Cover for Wildlife**

An approved habitat evaluation procedure shall be used to assess the time that residue is present, the amount and orientation of residue, and the height of stubble needed to provide adequate food and cover for the target species.

Harvest or tillage operations that disturb or cover the entire field shall not be performed during the nesting and brood-rearing period of the target species.

### **PLANS AND SPECIFICATIONS**

Specifications for establishment and operation of this practice shall be prepared for each field or treatment unit according to the Considerations, Criteria, and O&M described in this standard. Specifications shall be recorded using approved specification sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation.

### **OPERATION AND MAINTENANCE**

An operation and maintenance (O&M) plan shall be prepared for this practice. Appropriate job sheets may be used to serve as the management plan as well as supporting documentation, and shall be provided to the land user.

The producer/client is responsible for the operation and maintenance of the practice. Operation and maintenance activities address the following:

1. Crop rotation for each field;
2. Minimum percent residue to be maintained for each crop;
3. Type of tillage implements to be used.

#### **SUPPORTING DATA AND DOCUMENTATION**

The following is a list of the minimum data and documentation to be recorded in the case file:

1. Identify resource concern(s) to be treated (see the “purposes” section of this standard);
2. Identify the field location and extent of practice in acres, and complete the assistance notes. Assistance notes shall include dates of site inspections, name or initials of the person who made the inspections, specifics as to what was inspected, alternatives discussed, decisions made, and by whom;
3. Ensure that field number, acreage, crop rotation, and percent residue needed to address identified resource concern(s), and type(s) of tillage implements used are recorded in the conservation plan or on an applicable job sheet;
4. Operation and Maintenance plan or job sheet that includes the crop rotation, tillage implements, and minimum percent residue needed to address identified resource concern(s);
5. Soil loss calculations, if needed.

#### **REFERENCES**

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4. 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 Universal Soil Loss Equation (RUSLE)*. U.S. Handbook No. 703.
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6. 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.
7. USDA, Natural Resources Conservation Service, 2002. *National Agronomy Manual*. 190-V 3<sup>rd</sup> ed.
8. USDA Natural Resources Conservation Service, March, 2006. *Maryland RUSLE2 Manual*.