

## RESIDUE MANAGEMENT, MULCH TILL (ACRE)

### CODE 329B

#### MONTANA TECHNICAL GUIDE

#### SECTION IV

#### DEFINITION

Managing the amount, orientation, and distribution of crop and other plant residue on the soil surface year-round, while growing crops where the entire field surface is tilled prior to planting.

#### PURPOSE

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.
- Maintain or improve soil organic matter content and tilth.
- Conserve soil moisture.
- Manage snow to 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 standard 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.

#### CRITERIA

##### General Criteria Applicable To All Purposes Named Above

Loose residue to be retained on the field shall be uniformly distributed on the soil surface. Combines shall be equipped with spreaders capable of redistributing residue over at least 80 percent of the working width of the header.

Residue shall not be burned.

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

Planters, drills, or air seeders shall be equipped to plant in residue distributed on 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 components, shall be managed to achieve the planned amount, distribution, and orientation of residue after planting or at other essential time periods (**critical erosion periods**). Acceptable alternative tillage sequences shall be initially determined by a residue budget using locally applicable data on residue production by crops and residue reduction by tillage machines. (See **National Agronomy Manual, Part 503–Crop Production, Subpart E, Crop Residues; and the Field Office Technical Guide (FOTG), Section IV, Practice Standard 344–Residue Management, Seasonal**) Further adjustments shall be made, as needed during the tillage sequence, based on field measurements of remaining residue.

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**NOTE:** This type of font (**AaBbCcDdEe 123..**) indicates NRCS National Standards.  
This type of font (**AaBbCcDdEe 123..**) indicates Montana Supplement.

### **Additional Criteria To Reduce Sheet and Rill Erosion**

The amount of residue needed to reduce erosion within the soil loss tolerance (T) or any other planned soil loss objective, shall be determined using current approved erosion prediction technology (**Revised Universal Soil Loss Equation–RUSLE**). Partial removal of residue by means such as baling or grazing shall be limited to retain the amount needed. Calculations shall account for the effects of other practices in the conservation management system.

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

### **Additional Criteria To Reduce Wind Erosion**

The amount and orientation of residue needed to reduce erosion within the soil loss tolerance (T) or other planned soil loss objective shall be determined using current approved wind erosion prediction technology (**Wind Erosion Equation–WEQ Management Period Method**). Partial removal of residue by means such as baling or grazing shall be limited to retain the amount needed. Calculations shall account for the effects of other practices in the conservation system.

### **Additional Criteria To Maintain Or Improve Soil Organic Matter Content**

The amount of residue and the number of tillage operations needed to achieve the desired soil condition, shall be determined **on a field by field basis** using the current approved soil conditioning index procedure and/or **Mon-Dak Soil Health Score Card**. Partial removal of residue by means such as baling or grazing shall be limited to retain the amount needed. Calculations shall account for the effects of other practices in the conservation management system. **Dryland cropping systems will employ a “flexible cropping system” to maximize seasonal biomass production. (See FOTG, Section IV, Practice Standard 328–Conservation Crop Rotation.)**

### **Additional Criteria To Conserve Soil Moisture**

A minimum quantity of 50 percent 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 amount needed.

### **Additional Criteria to Manage Snow to Increase Plant Available Moisture**

Stubble shall be left standing as high as possible by the harvesting operation, but not less than 6 inches in any case.

Stubble shall be maintained in a standing “scalped” orientation over winter to trap and retain snow **maximizing soil moisture. A scalped orientation is where the combine leaves standing residue at a different height with each pass (i.e., first pass–10 inches, second pass–6 inches, third pass–12 inches, etc).** Loose residue may be removed providing that the remaining residue is left standing. Fall tillage shall be limited to undercutting tools such as Noble blades, sweeps, or deep tillage rippers or subsoilers, in order to maintain stubble in a standing condition through the months when snow occurs.

**A flexible crop system must be utilized to ensure that soil moisture is properly utilized to prevent soil salinity development.**

### **Additional Criteria To Provide Food And Escape Cover For Wildlife**

The amount of residue and height of stubble needed to provide cover shall be determined using an approved **wildlife** habitat evaluation procedure (**Montana Wildlife Habitat Appraisal Guide**). Residues shall not be removed unless it is determined by the habitat evaluation procedure that removal would not adversely affect **wildlife** habitat values. Stubble shall be maintained standing over winter. Tillage shall be delayed until spring, in order to maintain waste grain (**for a food source**) on the soil surface during winter.

## CONSIDERATIONS

Excess removal of plant residue by such means as baling or grazing often produces negative impacts on resources. These activities should not be performed without full evaluation of impacts on soil, water, animal, plants, and air.

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 or **chemical weed control**. Selection of acceptable tillage methods for specific site conditions may be aided by an approved Soil Tillage Suitability Rating—**not applicable to Montana**.

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.

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

The effectiveness of stubble to trap snow increases with stubble height. Variable height stubble patterns may be created to further increase snow storage.

Leaving rows of unharvested crop standing at intervals across the field can enhance the value of residues for wildlife habitat.

**Tillage with sweeps that run flat or blades that undercut the stubble will leave the greatest amount of residue on the surface of the soil.**

**Reduced speeds during tillage (less than 5 miles per hour) will bury less crop residue.**

**Fragile residues, as described in the National Agronomy Manual, Part 503–Crop Production, Subpart E–Crop Residues, are easily destroyed with tillage. TABLE 1 identifies crops with fragile residues.**

TABLE 1. Crops With Fragile Residues

Canola/Rapeseed	Mustard
Dry Beans	Potatoes
Dry Peas	Safflower
Fall seeded cover crops	Soybeans
Mint	Sugar Beets
Green Peas	Sunflowers
Lentils	Vegetables

TABLE 2. Crops With Non-Fragile Residues

Alfalfa or legume hay	Pasture
Barley*	Rye*
Buckwheat	Sorghum
Corn	Speltz*
Flaxseed	Triticale*
Forage Seed	Wheat*
Forage Silage	

\*If a combine is used with a straw chopper or otherwise cuts straw into small pieces in harvesting small grain, then the residue should be considered as being fragile.

**Adjusting equipment and using straight (versus twisted) points or sweeps can increase residue left on the soil surface.**

**The critical period for wind erosion is usually winter and early spring until growing crops protect the soil surface.**

**The critical period for water erosion is during spring seedbed preparation and after planting until the growing crop provides canopy over the soil. In the REQ area of Montana, the critical erosion period is throughout the winter when freeze-thaw cycles can occur and extending through the time when canopy cover can protect the soil surface after planting.**

## PLANS AND SPECIFICATIONS

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

using the approved specification sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation.

**A residue management, mulch tillage, practice establishment plan shall include the following information:**

- 1. Location map - field numbers and a map or sketch of the area to be established.**
- 2. Measured acres.**
- 3. Date practice scheduled and applied.**
- 4. Crops to be planted, associated planned residue amounts, percent surface cover, and orientation.**
- 5. Critical time periods to maintain residue**
- 6. Documentation of applied residue in pounds or percent by field or planning unit.**

**The Montana Residue Management, Mulch Till Specification is applicable to this practice and is required.**

## **OPERATION AND MAINTENANCE**

No operation and maintenance requirements, national in scope, have been identified for this practice.

## **REFERENCES**

USDA–Natural Resources Conservation Service, Field Office Technical Guide, Section IV, Practice Standard 645–Upland Wildlife Habitat Management, December 1984.

USDA–Natural Resources Conservation Service, Field Office Technical Guide, Section IV, Practice Standard 328–Conservation Crop Rotation, December 1998.

USDA–Natural Resources Conservation Service, National Agronomy Manual, Third Ed., Part 503–Crop Production, June 2000.

**Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.**

UNITED STATES DEPARTMENT OF AGRICULTURE  
 NATURAL RESOURCES CONSERVATION SERVICE

**RESIDUE MANAGEMENT, MULCH-TILL (ACRE)**

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**MONTANA CONSERVATION PRACTICE SPECIFICATION/JOB SHEET**

PRODUCER \_\_\_\_\_

FIELD NUMBER, TRACT, OR CTU \_\_\_\_\_

**SCOPE:** This specification provides guidelines to assure the mulch-till system meets the resource needs and the producers objectives. The specification is based on the amount, timing, and orientation of crop residue left on the soil surface.

**PURPOSE OF ESTABLISHMENT**

- Reduce water erosion.
- Conserve soil moisture.
- Improve soil quality
- Reduce wind erosion
- Manage snow cover for plant available water
- Improve wildlife habitat (food and cover)
- Other

**TABLE 1. Specifications**

TRACT/ FIELD	CROP TO BE PLANTED	PREVIOUS CROP RESIDUE	ORIENTATION STANDING OR FLAT	HEIGHT (INCHES)	CRITICAL SEASON(S)	POUNDS OF RESIDUE		PERCENT RESIDUE	
						PLANNED	APPLIED	PLANNED	APPLIED

**NOTES:** If residue is managed for wildlife benefits, describe planned wildlife provisions. Also use this space to describe row direction, grade restrictions, or other site specific requirements

**Soil Conditioning Index (SCI) available and used\***     Yes     No    **Calculated SCI Value:** \_\_\_\_\_

**Notes concerning soil quality:**

\*SCI provides an indication of the soil condition trend based on planned management. Positive values indicate an upward trend. Negative values indicate a downward trend. The values are based on how crops and management affect soil organic matter content.

