

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD

## RESIDUE MANAGEMENT, SEASONAL (ACRE)

### CODE 344

#### DEFINITION

Managing the amount, orientation, and distribution of crop and other plant residues on the soil surface during part of the year, while growing crops in a clean tilled seedbed.

80 percent of the working width of the header. **If harvesting equipment is not equipped to properly distribute residue, alternate equipment or methods may be used to distribute residue evenly over at least 80 percent of the surface area.**

Residues shall not be burned.

#### PURPOSES

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

- Reduce sheet and rill erosion.
- Reduce soil erosion from wind.
- Manage snow to increase plant available moisture.
- Provide food and escape cover for wildlife.

#### 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. See **RUSLE, Field Office Technical Guide (FOTG), Section I–Erosion Prediction**. Partial removal of residue by means such as baling or grazing shall be limited to retain the amount needed. The remaining residue shall be maintained on the surface through periods when sheet and rill erosion has the potential to occur, or until planting, whichever occurs first. Calculations shall account for the effects of other practices in the conservation management system.

#### CONDITIONS WHERE PRACTICE APPLIES

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

This standard includes residue management methods practiced during the part of the year from harvest until residue is buried by tillage for seedbed preparation.

**Residue reduction from grazing cropland aftermath should be based on a planned grazing system that specifies the number and kind of livestock and length of time livestock will remain in a particular field or planning unit. The amount of removal by grazing will be based on one AUM = 750 pounds of residue.**

#### CRITERIA

##### General Criteria Applicable To All Purposes

Loose residue to be retained on the field shall be uniformly distributed on the soil surface. Where combines or similar machines are used for harvesting, they shall be equipped with spreaders capable of redistributing residues over at least

Any tillage that occurs during the management period shall be limited to methods that leave residue on the surface and maintain the planned cover conditions.

**When crops are grown that result in low amounts of residue due to climatic conditions such as drought, flooding, or wildfire, supplemental conservation**

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

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

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measures such as applications of residue, manure, establishment of a cover crop, surface roughening, etc., are required to the extent that planned soil loss objectives are met.

### **Additional Criteria to Reduce Soil Erosion From Wind**

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 wind erosion prediction technology. See **WEQ Management Period Method, FOTG I– Erosion Prediction**. Partial removal of residue by means such as baling or grazing shall be limited to retain the amount needed. The remaining residue shall be maintained on the surface through periods when soil erosion by wind has the potential to occur, or until planting, whichever occurs first. Calculations shall account for the effects of other practices in the conservation management system.

**Residue reduction from grazing cropland aftermath should be based on a planned grazing system that specifies the number and kind of livestock and length of time livestock will remain in a particular field or planning unit. The amount of removal by grazing will be based on one AUM = 750 pounds of residue.**

Any tillage that occurs during the management period shall be limited to methods that leave residue on the surface and maintain the planned cover conditions.

**When crops are grown that result in low amounts of residue due to climatic conditions such as drought, flooding, or wildfire, supplemental conservation measures such as applications of residue, manure, establishment of a cover crop, surface roughening, etc., are required to the extent that planned soil loss objectives are met.**

### **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. For best results, stubble should be "scalped" (where the height of standing stubble is a different height with each pass)

Stubble shall be maintained in a standing orientation over winter to trap and retain snow. Any tillage that occurs during this period shall be limited to undercutting tools such as blades, sweeps, or deep tillage implements such as rippers or subsoilers **that cause a minimum of soil and residue disturbance.**

Loose residue may be removed providing that the remaining residue is left standing.

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

The amount of residue, height of the stubble, and length of the management period necessary for meeting habitat requirements for the target species or wildlife population shall be determined using an approved habitat evaluation procedure and **wildlife management plan.**

Residues shall not be removed, **burned, or tilled**, unless it is determined by the habitat evaluation procedure that such removal will not adversely affect habitat values.

Tillage shall be delayed until the end of the management period to maintain the food and cover value of the residue.

## **CONSIDERATIONS**

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

**In most cases, a higher percentage of crop residue is buried with tillage speeds of more than 5 mph.**

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, by the use of cover crops, and by adjustment of plant populations and row spacing.

**Approximately 80-85 percent of crop residues will remain on the soil surface after winter winds and decomposition during over-winter months.**

**Additionally, approximately 80-85 percent of crop residues will remain after the summer fallow period due to decomposition.**

When planting on a clean seedbed, exposure to erosion can be minimized by completing tillage and planting in a single operation, or by performing primary tillage no more than three days before planting.

When planting on a clean seedbed in areas with limited moisture, moisture for germination can be increased by completing tillage and planting in a single operation, or by performing primary tillage no more than three days before planting.

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 residue for wildlife habitat.

**Repeated burning of crop residues is not recommended. Repeated burning reduces soil fertility, water intake rates, soil organic matter, and increases the potential for erosion.**

## 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 approved certification sheets, job sheets, narrative statements in the conservation plan, or other acceptable methods.

**A residue management, seasonal establishment plan shall include the following information:**

1. **Locations map - field numbers and a map or sketch of the area to be established.**
2. **Measured acres.**

3. **Date implementation is scheduled and applied.**
4. **Before and After soil loss prediction documentation.**
5. **Critical time period(s) to maintain residue.**
6. **Amount (percent) of soil surface cover required to meet planned objectives.**
7. **The Residue Management, Seasonal specifications sheet.**

## OPERATION AND MAINTENANCE

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

## REFERENCES

Predicting Soil Erosion by Water: A Guide to Conversation Planning with the Revised Universal Soil Loss Equation (RUSLE), USDA ARS Ag. Handbook No. 703. January 1997.

USDA, Natural Resources Conservation Service, Field Office Technical Guide, Section IV, Practice Standards and Specifications, 645-Upland Wildlife Habitat Management, December 1984.

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

Burning: Effects on Soil Quality. R. Fasching, USDA-NRCS State Agronomist. November 1997.

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**NO INFORMATION**

NATURAL RESOURCES CONSERVATION SERVICE

**RESIDUE MANAGEMENT, SEASONAL** (ACRE)

**CODE 344**

**MONTANA CONSERVATION PRACTICE SPECIFICATION / JOB SHEET**

**DEFINITION:** Managing the amount, orientation, and distribution of crop and other plant residues on the soil surface during part of the year, while growing crops in a clean tilled seedbed.

**PURPOSE:** As part of a conservation management system, a seasonal residue management is an essential practice for all land where agricultural crops are grown to reduce erosion, manage snow to increase plant available moisture, and provide food and escape cover for wildlife.

**CONSERVATION MANAGEMENT SYSTEM:**

Seasonal residue management is established as part of a conservation management system to address the soil, water, air, plant, animal, and human needs as related to the owner's goals and objectives. It is important to consider crop rotation, nutrient and pest management, agricultural waste utilization, and other supportive conservation practices when designing a seasonal residue management system.

When crop residues are to be removed, or low residue crops are grown, protection against erosion may be provided by fall seeding a small grain crop, cover crops, surface roughening, or the addition of residue or manure.

The seasonal management of residue must be based on the amount of straw produced by the crop. When small amounts of residue are available after harvest, straw should not be grazed, baled, or burned unless adequate amounts are present to protect against erosion. Alternatives to mechanical weed control may need to be practiced to maximize residue retention.

Subsurface tillage equipment, which includes straight-blade or V-blades, rodweeders, and deep chisel implements have proven to retain the greatest amount of soil surface residue after each operation.

Tilling at slower speeds retains more crop residue on the soil surface.

Water infiltration rates may increase when high amounts of crop residue are maintained near the soil surface.

Standing stubble over winter will prevent erosion and trap snow for additional soil moisture.

**WILDLIFE:**

Properly designed seasonal residue management can also provide food and escape cover for wildlife. Seasonal residue management can enhance wildlife objectives depending on the crop species and management practiced. Consider using species and orientation or residue that can provide food and cover for important wildlife.

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**Specification MT344-2**

**NO INFORMATION**

**CROP RESIDUE USE—Seasonal Worksheet**

LANDOWNER	FIELD NUMBER
FIELD(S)	DATE

Predicted soil loss from wind or water must meet the planned soil loss objective for the key planning soil in a field or treatment unit. The following identifies residue amounts, timing, and orientation required to be maintained seasonally to meet the objectives of the producer. Use TABLE 1 to estimate percent residue remaining based on tillage information obtained.

TRACT/ FIELD	CROP	SOIL LOSS	ORIENTATION (STANDING/FLAT)	CRITICAL PERIOD	POUNDS OF RESIDUE		PERCENT RESIDUE	
					PLANNED	APPLIED	PLANNED	APPLIED

**TABLE 1. Estimating Crop Residue**

1 CROP	2 HARVEST UNITS <sup>1</sup>	3 YIELD	4 LBS. RESIDUE/ UNIT YIELD <sup>2</sup>	5 ESTIMATED RESIDUE/AC. (3 x 4)	6 OPERATION	7 PERCENT RETAINED <sup>3</sup>	8 LBS. RESIDUE LEFT (5 x 7)	9 % RESIDUE LEFT <sup>4</sup>

<sup>1</sup> Bushels, pounds, or tons per acre  
<sup>2</sup> From TABLE 2, Harvest Residue Ratios  
<sup>3</sup> From TABLE 3, Residue Reduction by Tillage  
<sup>4</sup> From Conversion Chart, FOTG, Section I, Erosion Prediction, Page C-43

**CERTIFICATION OF IMPLEMENTATION:**

\_\_\_\_\_  
 Producer

\_\_\_\_\_  
 Date

\_\_\_\_\_  
 NRCS or NRCS Certified Crop Advisor

\_\_\_\_\_  
 Date

## Specification MT344-4

TABLE 2. Harvest Residue Ratios

CROP	LBS. OF RESIDUE PER UNIT OF YIELD <sup>1</sup>
Spring Wheat	78 lbs./bu
Winter Wheat	108 lbs./bu
Durum	80 lbs./bu
Rye	75 lbs./bu
Barley	72 lbs./bu
Oats	60 lbs./bu
Flax	90 lbs./bu
Millet	80 lbs./bu
Triticale	90 lbs./bu
Sorghum	1.0 lbs./lb
Corn (grain)	1.0 lbs./lb
Lentils	1.1 lbs./lb
Safflower	1.5 lbs./lb
Sunflower	2.0 lbs./lb
Mustard	1.5 lbs./lb
Buckwheat	1.5 lbs./lb
Beans	1.0 lbs./lb
Peas	0.9 lbs./lb
Potatoes	125 lbs./ton
Sugar beets	140 lbs./ton
Fall Canola	2.5 lbs./lb
Spring Canola	1.6 lbs./lb

<sup>1</sup> Residue units are for estimating purposes only and may be significantly different depending on soil fertility, climatic conditions, and variety of crop species.

The following are guidelines for estimating dry weight of growing wheat seedlings:

One week after emergence—30 lbs/ac.

Wheat is in 1 - 2 leaf stage, about 3-5 inches tall.

Two weeks after emergence—70 lbs/ac.

Plants are in 2 - 3 leaf stage, erect, about 5-6 inches tall.

Three weeks after emergence—120 lbs/ac.

Leaves are less erect, increase is due to stooling, no increase in leaf length.

Five weeks after emergence—250 lbs/ac.

Plants are well stooled with leaves mostly prostrate.

Eight weeks after emergence—400 lbs/ac.

Growth is completely prostrate.

The following are guidelines for estimating residues of **corn** after harvest:

STALK HEIGHT (IN.)	6	300	600	750	900	1050
	5	250	500	625	750	875
	4	200	400	500	600	700
	3	150	300	375	450	525
	2	100	200	250	300	350
			10,000	20,000	25,000	30,000
PLANTS PER ACRE						

The following are guidelines for estimating residues of **sorghum** after harvest:

STALK HEIGHT (IN.)	6	240	480	600	720	840
	5	200	400	500	600	700
	4	260	320	400	480	560
	3	120	240	300	360	420
	2	80	160	200	240	280
			10,000	20,000	25,000	30,000
PLANTS PER ACRE						

**TABLE 3. Residue Reduction by Tillage**

IMPLEMENT	% RESIDUE REMAINING AFTER EACH OPERATION <sup>1</sup>	
	NON-FRAGILE	FRAGILE
Anhydrous Applicator	80	55
Bedder/lister	20	10
Chisel; str. points	70	50
Chisel; sweeps	75	55
Chisel; twisted points	60	35
Cult; primary-duckfoot	45	40
Cult; primary-swp 12-20"	70	65
Cult; primary-swp 6-12"	60	50
Cult; secondary-swp 6-12"	75	55
Cult; secondary-duckfoot	65	40
Cult; secondary-12-20"	85	65
Cultipacker roller	95	90
Disk harrow-tandem-primary	55	30
Drill; double disk opener	90	70
Drill; deep furrow	70	65
Drill; hoe opener	65	50
Drill; no-till	90	75
Harrow; spike tooth	80	70
Harrow; spring tooth	85	75
Manure Applicator; injector	50	30
Moldboard Plow; 8"	5	2
Moldboard Plow; 5-7"	10	5
Mulch Treader	75	65
Mulch Treader	75	65
Planter; double disk opener	90	80
Planter; no-till	95	90
Rodweeder; plain	90	60
Subsoiler	75	75
Sweeps' v-blade	90	75

<sup>1</sup> Residue reduction is for estimation purposes only and may be significantly different depending on speed of operation, climatic conditions, and implement design.

**Specification MT344-6**

**NO INFORMATION**