

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**RESIDUE AND TILLAGE MANAGEMENT  
RIDGE TILL**

(Ac.)

**Code 346**

**DEFINITION**

Managing the amount, orientation, and distribution of crop and other plant residues on the soil surface year-round, while growing crops on pre-formed ridges alternated with furrows protected by crop residue.

**PURPOSE**

- Reduce sheet and rill erosion
- Reduce wind erosion
- Maintain or improve soil quality
- Reduce energy use
- Manage snow to increase plant-available moisture
- Modify cool wet site conditions
- Provide food and escape cover for wildlife.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to all cropland

This practice includes tillage and planting methods commonly referred to as ridge till or ridge planting. It does not include no-till planting on ridges, or bedding or listing operations that bury crop residues.

**CRITERIA**

**General Criteria Applicable to All Purposes**

Following crop harvest, residues shall remain on the surface until planting with no additional disturbance except for normal weathering.

Ridge height shall be maintained throughout the harvest and winter seasons by controlling equipment and livestock traffic.

After planting, residues shall be maintained in the furrows until the ridges are rebuilt by cultivation. Ridges shall be rebuilt to their design height and shape during the last row cultivation.

**Stable Outlets.** A stable outlet must exist where ridges direct runoff to areas of concentrated flow.

**Maximum Row Grade.** Row grades shall not exceed those given in the following table.

10-Year Storm Erosivity Index (EI)	Maximum Row Grade (%) <sup>1</sup>
<100	9
100 – 150	7
>150	6

<sup>1</sup> Based on existing water erosion prediction technology (climate database).

Use the row grade limitation for next higher 10-year storm EI value:

- If sprinkler irrigation is used with this practice or
- Where residue cover is less than 30 percent, use the maximum row grade for the next higher 10-year storm EI value.

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

Soil and residue removed from the top of the ridge shall be moved into the furrow between the ridges.

After planting, the top of the ridge shall be maintained at least 3 inches higher than the furrow between the ridges.

The ridge top shall be shaped to direct runoff to the protected furrow area.

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

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When used in a system to reduce sheet and rill erosion the critical slope shall not exceed lengths determined using the current approved water erosion prediction technology. Calculations shall account for the effects of other practices in the conservation management system.

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

Ridges shall be designed using current wind erosion prediction model and must account for the effects of ridge height, spacing, and orientation to the direction of erosive winds.

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) or other 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 conservation management system.

#### **Additional Criteria to Maintain or Improve Soil Quality**

An evaluation of the cropping system using the current approved soil conditioning index (SCI) procedure shall result in a positive trend. Calculations shall account for the effects of other practices in the conservation management system.

Cultivation to rebuild ridges shall be done using tools that maintain residues in the surface layer.

#### **Additional Criteria to Reduce Energy Use**

*Ensure the Soil Tillage Intensity Rating (STIR) for the single crop establishment and harvest is less than or equal to 42.*

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

During the time that significant snowfall is expected to occur, the minimum distance between the bottom of the furrow and the top of the stubble shall be:

- 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.

If this minimum distance cannot be achieved, ridges shall be oriented not to exceed 45 degrees from perpendicular to the prevailing wind direction during periods of expected snowfall.

#### **Additional Criteria to Modify Cool Wet Site Conditions**

Ridge height prior to planting shall be at least 6 inches.

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

Determine residue duration, amount, orientation, and stubble height needed to provide adequate food and cover for target species using an approved habitat evaluation procedure.

### **CONSIDERATIONS**

**General** - Removal of residue, such as by burning, baling or grazing, can have negative impacts on resources. These activities should not be performed without full evaluation of impacts on soil, water, animal, plants and air resources.

Ridge till may be practiced continuously throughout some crop sequences, or may be managed as part of a residue management system that includes other tillage and planting methods such as mulch till or no till. In mixed systems, ridges must be periodically re-established. Selection of acceptable tillage methods for specific site conditions may be aided by an approved Soil Tillage Intensity Rating (STIR).

Alignment of ridges on the contour will aid management of runoff and sheet and rill erosion.

Production of adequate amounts of crop residues 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 population and/or row spacing.

Since row cultivation is typically used for weed control and to reform ridges, this practice has the potential to reduce herbicide requirements.

A field border (see code 386) planted to permanent vegetation can assist in

unobstructed turning, elimination of end rows, providing travel lanes for farming operations, and can 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.

***Maintaining or Improving Soil Quality and Reducing CO<sub>2</sub> Loss from the Soil -***

Continuous ridge planting will allow organic material to accumulate in the surface horizon. Reconstruction of ridges in the same row area year after year will maximize organic matter buildup and biological activity in the row.

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.

- Shallow soil disturbance (1-3 inches) releases less CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> than operations done when the soil is warmer.

Soil compaction may be reduced by controlled traffic, in which wheel traffic from all operations is limited to the area between designated rows or traffic areas.

***Providing Food and Escape Cover for Wildlife*** - Avoid disturbing standing stubble or heavy residue during the nesting season 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.

## **PLANS AND SPECIFICATIONS**

Plans and specifications shall include:

- field number and acres
- purposes(s) for this practice
- crops where this practice will be used
- the type and timing of soil disturbing operations
- estimated surface residue following each operation.

Specifications for establishment and operation 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. Specifications shall be recorded using approved specification sheets, job sheets, narrative statements in the conservation plan or other acceptable documentation.

## **OPERATION AND MAINTENANCE**

Evaluate/measure the crop residues cover and orientation and ridge height for each crop to ensure the planned amounts and orientation are being achieved. Adjust management as needed to either plan a new residue amount or orientation; or adjust the planting, tillage/cultivation, or harvesting equipment.

## **REFERENCES**

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

Kuepper, George, 2001. Pursuing conservation tillage systems for organic crop production. ATTRA.

<http://attra.ncat.org/attra-pub/organicmatters/conservationtillage.html>

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). Agricultural Handbook 703.

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 USDA, Agriculture Handbook 346.

USDA, NRCS. 2011. National Agronomy Manual. 190-V. 4<sup>th</sup> Ed.