



**Natural Resources Conservation Service**  
**CONSERVATION PRACTICE STANDARD**  
**RESIDUE AND TILLAGE MANAGEMENT, NO TILL**

**CODE 329**

**(ac)**

**DEFINITION**

Limiting soil disturbance to manage the amount, orientation and distribution of crop and plant residue on the soil surface year around.

**PURPOSE**

This practice is used to accomplish one or more of the following purposes:

- Reduce sheet, rill and wind erosion and excessive sediment in surface waters
- Reduce tillage-induced particulate emissions
- Maintain or increase soil health and organic matter content
- Increase plant-available moisture
- Reduce energy use
- Provide food and escape cover for wildlife

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to all cropland.

**CRITERIA**

**General Criteria Applicable to All Purposes**

Do not burn residue.

Distribute all residues uniformly over the entire field. Removing residue from directly within the seeding or transplanting area prior to or as part of the planting operation is acceptable.

This practice only involves an in-row soil disturbance operation during strip tillage, the planting operation, and a seed row/furrow closing device. There is no full-width soil disturbance performed from the time immediately following harvest or termination of one cash crop through harvest or termination of the next cash crop in the rotation regardless of the depth of the tillage operation. The soil tillage intensity rating (STIR) value includes all field operations performed during the crop interval between harvest and termination of the previous cash crop and harvest or termination of the current cash crop (includes fallow periods). Ensure the crop interval STIR value does not exceed 20.

**Additional Criteria to Reduce Sheet, Rill and Wind Erosion, Reduce Excessive Sediment in Surface Waters, and Reduce Tillage-Induced Particulate Emissions**

Use the current approved water and wind erosion prediction technology to determine the if field operations planned provide the amount of randomly distributed surface residue needed, time of year residue needs to be present in the field, and amount of surface soil disturbance allowed to reduce erosion to the desired level. Account for the effects of other practices in the management system in all calculations.

NRCS reviews and periodically updates conservation practice standards. To obtain the current version of this standard, contact your Natural Resources Conservation Service State office or visit the Field Office Technical Guide online by going to the NRCS website at <https://www.nrcs.usda.gov/> and type FOTG in the search field.

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**Additional Criteria to Maintain or Increase Soil Health and Organic Matter Content**

Ensure the soil condition index (SCI) for the cropping system results in a positive rating.

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

Maintain a minimum of 60 percent residue cover on the soil surface throughout the year. Maintain a minimum of 2000 pounds per acre (small grain equivalents) of residue cover on the soil surface.

**Trapping snow**

Ensure minimum crop stubble height during the time significant snowfall is expected to occur is—

- 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.

**Additional Criteria to Reduce Energy Use**

Reduce the total energy consumption associated with field operations by at least 25 percent compared to the benchmark condition. Use the current approved NRCS tool for determining energy use to document energy use reductions.

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

Use an approved habitat evaluation procedure to determine when residue needs to be present, and the amount, orientation, and stubble height needed to provide adequate food and cover for target species.

**CONSIDERATIONS****General Considerations**

Removal of crop residue, such as by baling or grazing, can have a negative impact on resources. Do not perform these activities without full evaluation of impacts on soil, water, animal, plant, and air resources.

Enhance production of adequate crop residues to achieve the purpose(s) of this practice using high residue crops and crop varieties, cover crops, double cropping, and adjusting plant populations through seeding rates and row spacing.

When providing technical assistance to organic producers, ensure residue and tillage management, activities are consistent with the USDA Agricultural Marketing Service National Organic Program regulations.

Do not shred residue after harvest. Shredding residue makes it more susceptible to movement by wind or water, and residue accumulation can interfere with planting the next crop.

Using residue management - no till for all crops in the rotation or cropping system can enhance the positive effects of this practice by—

- Increasing the rate of soil organic matter accumulation.
- Keeping soil in a consolidated condition and improved aggregate stability.
- Sequestering additional carbon in the soil.
- Further reducing the amount of particulate matter generated by field operations.
- Reduce energy inputs to establish crops.
- Forming root channels and other near-surface voids that increase infiltration.

**Considerations to Increase Soil Health and Organic Matter Content**

Carbon loss is directly related to the volume of soil disturbed, intensity of the disturbance and soil moisture content and soil temperature at the time the disturbance occurs. To make this practice more effective—

- 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.

- Planting with a single disk or slot opener no-till drill will release less CO<sub>2</sub> and oxidize less organic matter than planting with a wide-point hoe/chisel opener seeder drill.
- Soil disturbance that occurs when soil temperatures are below 50° F will oxidize less organic matter and release less CO<sub>2</sub> than operations done when the soil is warmer.
- Maximizing year-round coverage of the soil with living vegetation (e.g., cover crops) and/or crop residues builds organic matter and reduces soil temperature, thereby slowing organic matter oxidation.
- Use a diverse crop rotation, incorporating multiple crop types (cool-season grass, cool-season legume/forb, warm-season grass, warm-season legume/forb) into the crop rotation.
- Plant a cover crop after every cash crop in the rotation. Multispecies cover crop mixes provide greater benefits than single-specie cover crops.

### **Considerations to Improving Soil Health/Quality**

To achieve major improvements in soil health requires more than no-till alone. The following activities/practices are needed to make significant changes in soil health:

- Use a diverse crop rotation, incorporating multiple crop types (cool-season grass, cool-season legume/forb, warm-season grass, warm-season legume/forb) into the crop rotation.
- Plant a cover crop after every cash crop in the rotation. Multi-species cover crop mixes provide greater benefits than single-species cover crops.

### **Considerations to Increase Plant-Available Moisture (Managing Soil Moisture and Protecting Crops from Freeze Damage)**

The type, timing, and depth of soil-disturbing activities all influence moisture loss. Shallow operations (1 to 2 inches) or operations that do not invert the soil reduce moisture loss compared to deeper operations or those that invert and mix the soil.

Soil-disturbing operations performed when the soil surface is moist results in greater moisture loss than operations done when the top 2 to 3 inches of soil have dried.

Leaving stubble taller than the minimum required increases the relative humidity close to the soil surface, which reduces the rate of evaporative loss from the soil. Leaving stubble taller than the 10-inch minimum traps more snow.

Create variable-height stubble patterns to further increase snow storage.

Performing all field operations on the contour slows overland flow and allows more opportunity for infiltration.

### **Considerations for Wildlife Food and Cover**

Leaving rows of unharvested crop standing at intervals across the field or adjacent to permanent cover enhances the value of residues for wildlife food and cover. Leaving unharvested crop rows for two growing seasons further enhances the value of these areas for wildlife.

Leave crop residues undisturbed after harvest (e.g., no shredding or baling) to maximize the cover and food source benefits for wildlife.

## **PLANS AND SPECIFICATIONS**

Prepare specifications for establishment and operation of this practice for each field or treatment unit. Record the specifications using the practice implementation requirements document. Ensure specifications, as appropriate—

- Purpose for applying the practice.
- Planned crops.
- Amount of residue produced by each crop.
- All field operations or activities that affect the—
  - Residue orientation including height (where applicable).
  - Surface disturbance.
  - Amount of residue (pounds/acre or percent surface cover) required to accomplish the purpose, and the time of year it must be present.
- Planned soil tillage intensity rating STIR value, soil condition index value, and erosion rate.
- Target species of wildlife, if applicable.
- Benchmark and planned fuel consumption, if applicable.

## **OPERATION AND MAINTENANCE**

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

Limited tillage is allowed to close or level ruts from harvesting equipment. Till no more than 10 percent of the field for this purpose.

If heavy residue accumulation (because of movement by water or wind) is present in the field, spread the residue prior to planting to reduce interference with planter operation.

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