

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
RESIDUE AND TILLAGE MANAGEMENT
NO TILL/STRIP TILL/DIRECT SEED**

(Ac.)

CODE 329

DEFINITION

Managing the amount, orientation and distribution of crop and other plant residue on the soil surface year round while limiting soil-disturbing activities to only those necessary to place nutrients, condition residue and plant crops.

PURPOSE

- Reduce sheet and rill erosion.
- Reduce wind erosion.
- Improve soil organic matter content.
- Reduce CO₂ losses from the soil.
- Reduce soil particulate emissions.
- ***Reduce energy use.***
- 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 planted.

This practice includes planting methods commonly referred to as no-till, strip till, direct seed, zero till, slot till or zone till. Approved implements are: no-till and strip-till planters; certain drills and air seeders; strip-type fertilizer and manure injectors and applicators; in-row chisels; and similar implements that only disturb strips and slots. All others are considered to be full-width or capable of full disturbance and therefore not compatible.

CRITERIA

General Criteria Applicable to All Purposes

Residue shall not be burned.

All residues shall be uniformly distributed over the entire field.

No full-width tillage shall be performed regardless of the depth of the tillage operation.

The Soil Tillage Intensity Rating (STIR) value shall include all field operations that are performed during the crop interval between harvest of the previous crop and harvest or termination of the current crop (includes fallow periods). The STIR value shall be no greater than 30.

Additional Criteria to Reduce Sheet and Rill Erosion; Reduce wind Erosion; Reduce Soil particulate Emissions

The amount and orientation of standing and surface residue needed and the amount of surface soil disturbance allowed to reduce erosion to the planned soil loss objective shall be determined using the current approved water and/or wind erosion prediction technology. Calculations shall account for the effects of other practices in the management system.

Partial removal of residue by means such as baling or grazing shall be limited to retain a minimum of 40 percent residue.

Additional Criteria to Improve Soil Organic Matter Content

An evaluation of the cropping system using the current approved soil conditioning index procedure shall result in a positive trend.

Erosion shall not exceed the soil loss tolerance (T).

A minimum of 50 percent residue cover shall be maintained throughout the year. Residue shall be evenly distributed and maintained on the soil surface.

Additional Criteria to Reduce CO₂ Loss from the Soil

The Soil Tillage Intensity Rating (STIR) value shall include all field operations that are performed during the crop interval between harvest of the previous crop and harvest or termination of the current crop and shall be no more than 20.

An evaluation of the cropping system using the current approved soil conditioning index procedure shall result in a positive trend.

Additional Criteria to Reduce Energy Use

The number and/or intensity of residue management and tillage operations shall provide at least 20% reduction in fuel usage as compared with the client's benchmark/existing system as measured with approved NRCS energy prediction software.

Additional Criteria to Increase Plant-available Moisture

Reducing Evaporation from the Soil Surface. The annual Soil Tillage Intensity Rating (STIR) value for all soil-disturbing activities in the cropping system shall be no more than 20.

Crop stubble height during the time evaporation losses can be expected to occur 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.

These stubble heights shall be present on at least 60% of the field.

Trapping Snow. Crop stubble height during the time significant snowfall is expected to occur 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.

These heights shall be present over at least 50% of the field.

Fall field operations that disturb residue shall be done as close to perpendicular as possible to the direction of prevailing winds during the time that significant snowfall is expected to occur.

Additional Criteria to Provide Food and Cover for Wildlife

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 shall be determined using *the WV Wildlife Habitat Evaluation Technique (WVWHET) or the West Virginia Pollinator Handbook.*

Pollinators

Protect pollinator nesting sites by leaving standing crop residue to protect bees that are nesting in the ground at the base of the plants they pollinate (i.e., squash). A minimum of one row of un-harvested or 5 feet of undisturbed refugia along edges of fields is required to provide nesting sites for ground nesting bees. If this is not feasible, minimize soil disturbance in nesting areas. Disturbance shall not exceed 3 inches in depth in these areas.

To provide nesting sites conversion from conventional tillage to no-till is required to

provide nesting opportunities for native pollinators. Tillage digs up these nests or blocks emergence of new adult bees the preceding year.

Residue management shall be a component of a cropping sequence and or rotation that accounts for nesting habitat and requirements of pollinators. Refer to (328) Conservation Crop Rotation for cropping sequence information.

CONSIDERATIONS

General - Removing of crop residue, such as by baling or grazing, can **reduce surface residue levels**. These activities should not be performed without full evaluation of impacts on soil, water, animal, plant and air resources. ***If significant crop residues are removed from row crops, they should be replaced with cover crops planted no later than October 15. See Cover Crop, (code 340).***

Production of adequate amounts of crop residues necessary to achieve the purposes 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.

Using no till/strip till/direct seed 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, which provides additional resistance to sheet and rill erosion.
- sequestering more carbon in the soil.
- further reducing the amount of particulate matter generated by field operations.
- forming root channels and other near-surface voids that increase infiltration.

A field border planted to permanent vegetation can:

- allow unobstructed turning for equipment
- eliminate unproductive end rows
- provide food and escape cover for wildlife

- provide travel lanes for farming operations.

Increasing Soil Organic Matter Level and Reducing CO₂ Loss

CO₂ 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. The following guidelines can make this practice more effective:

- Shallow soil disturbance (1-3 inches) releases less CO₂ than deeper operations.
- 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 opener no-till drill will release less CO₂ 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 CO₂ than operations done when the soil is warmer.

Reducing Soil Particulate Emissions

Slower operating speeds generally produce fewer particulate emissions.

Dry soils will produce more particulates than moist soils.

Reducing the wind erosion rate below the tolerable soil loss will help reduce particulate emissions. This can be done by:

- increasing the level of crop residue cover
- reducing the number of soil-disturbing operations
- installing other practices to reduce wind erosion, such as Herbaceous Wind Barriers (code 603) or Cross Wind Trap Strips (code 589C).

Managing Soil Moisture and Protecting Crops from Freeze Damage

The type, timing and depth of soil-disturbing activities all influence moisture loss. Shallow operations (1-2 inches) or operations that do not invert the soil will 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 will result in greater moisture loss than operations done when the top two to three inches of soil have dried.

Leaving stubble taller than the minimum required will increase 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 will trap more snow and provide better protection to plants from freezing or desiccation.

Variable-height stubble patterns may be created to further increase snow storage.

Performing all field operations on the contour will slow overland flow and allow more opportunity for infiltration.

Wildlife Food and Cover

Consider leaving standing crops or residue to benefit wildlife species such as bobwhite quail or native pollinators. Refer to the West Virginia Pollinator Handbook or the most recent West Virginia Wildlife Habitat Evaluation Technique (WVWHET) for species that are benefitted by residue management.

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.

Leave crop residues undisturbed after harvest (do not shred or roll) to maximize their cover and food source benefits.

If necessary, relevant and feasible, avoid disturbing standing stubble or heavy residue during the nesting season for ground-nesting species (***March 15 – July 15***).

PLANS AND SPECIFICATIONS

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

Specifications will include the following:

1. Identify the resource concern(s) to be treated.
2. Ensure that the field location, acreage, crop rotation, tillage sequence, and percent residue needed to address the identified resource concern(s) are recorded as needed in the conservation plan.
3. Types of tillage implements used.
4. Soil loss calculations, if needed.
5. Soil Condition Index (SCI) documentation
6. Soil tillage Index Rating (STIR) documentation.
7. ***If wildlife or pollinator habitat is a purpose, identify the amount, type or residue or remaining crops and or tillage depths and areas affected.***
8. ***CPA-52 or similar acceptable environmental evaluation documentation***

OPERATION AND MAINTENANCE

Proper adjustments, operation, and maintenance of equipment is essential for successful implementation of this practice.

REFERENCES

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****Bold italics is information added to the national standard by West Virginia.***