

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

**RESIDUE AND TILLAGE MANAGEMENT
NO TILL/STRIP TILL/DIRECT SEED**

(Acre)

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
- 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 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

Do not burn residues.

Distribute all loose residues uniformly over the entire field.

Do not perform full-width tillage regardless of the depth of the tillage operation.

The Soil Tillage Intensity Rating (STIR) value shall include all field operations 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

Use current approved erosion prediction technology to determine the amount of randomly distributed surface residue needed, and the amount of surface soil disturbance allowed while decreasing sheet and rill erosion to the planned soil loss objective. Calculations shall account for the effects of other practices in the management system.

Additional Criteria to Reduce Wind Erosion

Use current approved erosion prediction technology to determine the amount and orientation of standing and surface residue needed, and the amount of surface soil disturbance allowed while decreasing wind erosion to the planned soil loss objective. Calculations shall account for the effects of other practices in the management system.

Additional Criteria to Improve Soil Condition

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

Additional Criteria to Reduce CO₂ Loss from the Soil

The annual Soil Tillage Intensity Rating (STIR) value for all soil-disturbing activities 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 Soil Particulate Emissions

Use current approved erosion prediction technology to determine the amount and orientation of residue needed, and the amount of surface soil disturbance allowed while decreasing wind erosion to the soil loss tolerance value (T). Calculations shall account for the effects of other practices in the conservation management system.

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.

Maintain the following crop stubble heights on at least 60% of the field during the time evaporation losses should occur.

- 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

Trapping Snow

Maintain the following crop stubble heights over at least 50% of the field during the time of year when significant snowfall should occur.

- 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

Orient fall field operations that disturb residues as close to perpendicular as possible to the prevailing wind direction, during the time of year when significant snowfall should occur.

Additional Criteria to Provide Food and Cover for Wildlife

Determine the timing, amounts, orientation and stubble heights needed to provide adequate food and cover for the target species using an approved habitat evaluation procedure.

CONSIDERATIONS**General**

Removing crop residues by means such as baling or grazing can have a negative impact on other resources. Do not remove residues without evaluating the impacts to soil, water, air plant and animal resources.

The production of adequate amounts of crop residues necessary to achieve the stated purpose for applying this practice can be enhanced by selecting high residue producing crops and varieties in the rotation, use of cover crops, and adjusting plant populations and row spacing.

Using a no till/strip till/direct seed system for all crops in the rotation or cropping system can have the following positive effects.

- increase the rate of soil organic matter accumulation
- maintain soil structure to provide additional resistance to erosion
- sequester more carbon in the soil
- decrease particulate matter generation by field operations
- form root channels and other near-surface voids to increase infiltration

Field borders planted to permanent vegetation can allow unobstructed equipment turning, eliminate unproductive end rows, provide food and escape cover for wildlife, and provide travel lanes for farming operations.

Increasing Soil Organic Matter Levels and Decreasing CO₂ Losses from the Soil

Carbon dioxide (CO₂) losses are proportionate 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. Application of the following guidelines can increase the effectiveness of this practice.

- Shallow soil disturbances (1-3 inches) will release less CO₂ than deeper operations
- When sub-soiling or injecting fertilizers, make sure the vertical tillage slot created by these implements closes at the soil surface
- Planting with a single disk opener no-till drill will release less CO₂ than planting with a wide-point hoe/chisel opener 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.

The following suggestions can further decrease wind erosion rates and particulate emissions.

- increase the level of crop residue cover
- decrease the number of soil-disturbing operations
- install additional practices 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 influence soil moisture loss. Shallow operations (1-2 inches) or operations that do not invert the soil will decrease moisture losses 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 losses than operations completed when the top two to three inches of soil have dried.

Leaving stubble taller than the minimum height required can increase the relative humidity close to the soil surface and decrease 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.

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

Perform all field operations on the contour to slow overland flow and increase infiltration.

Wildlife Food and Cover

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.

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

Avoid disturbing standing stubble or heavy residue during the nesting season for ground-nesting species.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for each field or treatment unit according to the Criteria, Considerations and Operation and Maintenance sections of this standard.

Specifications shall describe the requirements for applying this practice to meet the intended purpose.

Record practice specifications on the Colorado Residue and Tillage Management 329, No Till/Strip Till/Direct Seed, Conservation Practice Job Sheet.

OPERATION AND MAINTENANCE

There are no national operation and maintenance requirements identified for this practice.

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