

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 residues on the soil surface year round while [limiting soil-disturbing activities to only those necessary to place nutrients, condition residue, and plant crops.](#)

PURPOSES

This practice may be applied to support one or more of the following purposes:

- Reduce sheet and rill erosion.
- Reduce wind erosion.
- [Improve soil organic matter content.](#)
- [Reduce carbon dioxide 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 planted.

This practice includes planting methods commonly referred to as no till, strip till, direct seed, zero till, slot till, or zone till.

CRITERIA

General Criteria Applicable to All Purposes

Loose residues to be retained on the field shall be uniformly distributed on the soil surface.

Combines or similar machines used for harvesting shall be equipped with choppers and spreaders capable of distributing residue over at least 80 percent of the working width of the header. When combines are equipped with a stripper header, only a chaff spreader is needed.

Planters or drills shall be equipped to plant directly through untilled residue or in a tilled seedbed prepared in a narrow strip along each row by planter attachments such as rotary tillers, sweeps, multiple coulters, or row cleaning devices.

Residues shall not be burned.

No full-width tillage shall be performed regardless of the depth of the tillage operation. Seedbed preparation, planting, and fertilizer placement shall disturb no more than one third (1/3) of the row width. The row area created by the planting operation shall be level or slightly above the adjacent row middles unless the rows are planted on the contour.

[The annual Soil Tillage Intensity Rating \(STIR\) value for all soil-disturbing activities shall be no greater than 15.](#)

Additional Criteria to Reduce Sheet and Rill Erosion

The amount of randomly distributed 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 erosion prediction technology. Calculations shall account for the effects of other practices in the management system.

Additional Criteria to Reduce Wind Erosion

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 wind erosion prediction technology. Calculations shall account for the effects of other practices in the management system.

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.

Partial removal of residue by means such as baling or grazing shall be limited to retain the amount needed for the desired soil condition. Calculations shall account for the effects of other practices in the management system.

Additional Criteria to Reduce Carbon Dioxide Losses from the Soil

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

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) shall be determined using the current approved wind erosion prediction technology. Calculations shall account for the effects of other practices in the management system.

Additional Criteria to Increase Plant Available Moisture

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; or
- 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 percent of the field.

Partial removal of residue by means such as baling or grazing shall be limited to retain the minimum amount needed to conserve soil moisture.

Additional Criteria to Provide Food and Escape Cover for Wildlife

The time residue is present, the amount and orientation of residue, and the height of stubble needed to provide adequate food and escape cover will be provided for the targeted wildlife species. Residues shall not be removed unless it is determined by a habitat evaluation procedure, Wildlife Habitat Assessment Guide, that residue removal would not adversely affect habitat values.

CONSIDERATIONS

General - Removing crop residue such as by baling or grazing can have a negative impact on resources. These activities should not be performed without a full evaluation of impacts on soil, water, animal, plant, and air resources.

Production of adequate amounts of crop residues necessary to achieve the purposes of this practice can be enhanced by the selection of high residue crops and crop varieties in the rotation, use of cover crops, and adjustments to 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 erosion forces;
- sequestering more carbon into the soil;
- further reducing the amount of particulate matter generated by field operations; and
- forming root channels and other near-surface voids that increase infiltration.
- planting with a single disk opener no-till drill will release less carbon dioxide than planting with a wide-point hoe or chisel opener air seeder drill; and
- soil disturbances that occur when soil temperatures are below 50^o F will release less carbon dioxide than when the soil is warmer.

Fertilizer placement below the soil surface with knives or point injection is desired for availability of nitrogen, phosphorus, and potassium. Surface applications of fertilizers may result in stratification of phosphorus and potassium in the top 2 inches of soil and losses of ammonia nitrogen to volatilization.

Using a combination of conservation practices can improve the benefits of no till / strip till / direct seed management. A field border planted and maintained in permanent vegetative cover can:

- allow unobstructed turning for field equipment;
- eliminate unproductive end rows;
- provide food and escape cover for wildlife; and
- provide travel lanes for farming operations.

Increasing Soil Organic Matter Level and Reducing Carbon Dioxide Losses – Carbon dioxide 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 disturbances (1 to 3 inches) release less carbon dioxide than deeper operations;
- when deep soil disturbance is performed, such as subsoiling or fertilizer injection, make sure the vertical slot created by these implements is closed at the surface;

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 accomplished by:

- increasing the level of crop residue cover;
- reducing the number of soil-disturbing operations; and
- installing other practices to reduce wind erosion such as Herbaceous Wind Barriers (603) or Cross Wind Trap Strips (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 to 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 and reduce the rate of evaporative loss from the soil.

The effectiveness of stubble to trap snow or reduce plant damage from freezing or desiccation increases with stubble height. Leaving stubble taller than the 10-inch minimum is desired. Patterns of variable stubble heights 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 Escape 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.

Leave crop residues undisturbed after harvest (do not shred or roll) to 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

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.

OPERATION AND MAINTENANCE

No specific operation and maintenance requirements have been identified for this practice.

REFERENCES

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