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
- Reduce irrigation induced erosion
- Improve soil organic matter content
- Reduce CO_2 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

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

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 Reduce Irrigation Induced Erosion

The relative effectiveness of sediment delivery off-site shall be determined using the current, approved sediment delivery prediction technology, Surface Irrigation Soil Loss Model (SISL). Planned or applied systems shall be within the soil loss tolerance (T) or other planned soil loss objectives. Partial removal of residue by means such as baling or grazing shall be limited to retain the amount needed for

maintenance of a positive soil-conditioning index.

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 CO_2 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

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 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.

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 an approved habitat evaluation procedure.

CONSIDERATIONS

General – Individual conservation practices should be planned as part of a conservation plan which addresses all resource concerns identified on the planning unit and reaches a Resource Management System (RMS) level of treatment.

Removing of crop residue, such as by baling or grazing, can have a negative impact on resources. These activities should not be performed without 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 selection of high-residue producing crops and crop varieties in the rotation, use of cover crops and adjustment of plant populations and row spacing.

The benefits described below for this practice can only be achieved when it is used on all crops in the rotation. 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 CO_2 Loss - CO_2 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 CO_2 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 CO_2 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_2 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 (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 (1-2 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 - 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 application of this practice shall be generated using the current sediment delivery prediction technology or soil condition tool as described within this standard (RUSLE2, SISL, WEQ, SCI).

Specifications shall be provided to the producer as part of a progressive or complete conservation plan prior to implementation of the practice.

OPERATION AND MAINTENANCE

No operation and maintenance requirements, national in scope, have been identified for this practice.

REFERENCES

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