

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
RESIDUE MANAGEMENT, SEASONAL**

(Ac.)

CODE 344

DEFINITION

Managing the amount, orientation, and distribution of crop and other plant residues on the soil surface during a specified period of the year.

PURPOSES

- Reduce sheet and rill erosion.
- Reduce wind erosion and associated airborne particulate matter.
- Maintain or improve soil quality.
- Manage snow to increase plant available moisture.
- Harvest and utilize crop residues as renewable bioenergy feedstocks.
- Provide food and escape cover for wildlife.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cropland including cropland where biomass is removed for biofuel feedstocks.

Seasonal residue management includes managing residues of annual crops and maintaining adequate residue cover during critical times of the year from harvest until the residue is:

- Buried by tillage for seedbed preparation
- Removed by grazing, or
- Mechanically removed

It also includes the management of residues from biennial or perennial seed crops from the time of seed harvest until regrowth begins the next season.

CRITERIA

General Criteria Applicable to All Purposes

All residues shall be uniformly distributed over the entire field.

Where combines or similar machines are used for harvesting, they shall be equipped with spreaders capable of uniformly distributing residue over at least 80 percent of the working width of the header.

Residues shall not be burned.

The number, sequence, and timing of tillage and planting operations, and the selection of ground-engaging components, shall be managed to achieve the planned amount, distribution, and orientation of residue after planting or at other essential time periods. Acceptable alternative tillage sequences shall be evaluated using the current approved erosion prediction technology.

Limit tillage operations during the residue management period to undercutting tools such as blades or wide sweeps that minimize residue flattening or burial

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. Erosion prediction estimates shall account for the effects of other practices in the conservation management system.

Partial removal of residue by means such as baling, grazing, or other harvest methods shall be limited to retain the amount needed to meet the erosion reduction objective. The remaining residue shall be maintained on the surface

through periods when erosion has the potential to occur, or until planting, whichever occurs first.

Any tillage that occurs during the management period shall be limited to methods which leave residue on the surface and maintain the planned cover conditions needed to achieve soil loss objectives.

Additional Criteria to Reduce Wind Erosion

The amount and orientation of standing and surface residue, the amount of surface soil disturbance allowed, and the row direction and ridge height needed at specific times of the year to reduce erosion to the planned soil loss objective shall be determined using the current approved wind erosion prediction technology. Erosion prediction estimates shall account for the effects of other practices in the conservation management system.

Partial removal of residue by means such as baling, grazing, or other harvest methods shall be limited to retain the amount needed to meet the erosion reduction objective. The remaining residue shall be maintained on the surface through periods when erosion has the potential to occur, or until planting, whichever occurs first.

Any tillage that occurs during the management period shall be limited to methods which leave residue on the surface and maintain the planned cover conditions needed to achieve soil loss objectives.

Additional Criteria to Maintain or Improve Soil Quality

The Soil Conditioning Index (SCI) will be utilized to determine whether there is a positive or improving trend in soil condition/quality. The SCI is calculated within the Revised Universal Soil Loss Equation, Version 2 (RUSLE2) and included as output on NE-CPA-30. It is also included in the output from the Wind Erosion Prediction System (WEPS).

Calculations shall account for the effects of other practices in the conservation management system.

Additional Criteria to Manage Snow to Increase Plant-Available Moisture

Trapping Snow. Crop stubble standing 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 the entire field and at least 50 percent of the crop stubble shall be left standing after harvest.

Limit fall field operations that disturb residue to undercutting type tools and 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 Harvest and Utilize Crop Residues as Renewable Bioenergy Feedstocks

Partial removal of residue by baling or other harvest methods shall be limited to retain the amount needed to meet the erosion reduction objective. The remaining residue shall be maintained on the surface through periods when erosion has the potential to occur, or until planting, whichever occurs first.

Additional Criteria to Provide Food and Escape Cover for Wildlife

Crop selection, residue management including type, amount, disturbance, timeframes, and other factors shall have a minimum habitat index value (0.5) as shown in Wildlife Habitat Quality Criteria in Section III of the FOTG. The Wildlife Habitat Evaluation Worksheet for cropland (NE-CPA-32) will be utilized to conduct the habitat evaluation. The residue management shall address the necessary habitat values to meet the needs of wildlife.

Residue and tillage management is directly related to the Disturbance factor and may be influenced by the Crop Rotation factor. The planned system may also need to address Field Size; Field Borders; Buffers; Odd Areas; and Interspersion of Habitats in order to meet quality criteria requirements for wildlife.

CONSIDERATIONS

General – Removal of plant residue by baling or grazing may have a negative impact on resources. These activities should not be performed without full evaluation of impacts on soil, water, animal, plant, air and energy resources.

Production of adequate amounts of crop residue necessary for the proper functioning of this practice can be enhanced by selection of high residue producing crops and crop varieties, by the use of cover crops, and by adjustment of plant populations and row spacing.

Crop residues provide food and habitat for soil organisms, which positively impacts soil aggregate stability, moisture retention, infiltration and fertility.

No-till planting cover crops that winter-kill in the late summer and fall will provide additional food and cover for wildlife, supplemental grazing, soil erosion protection, and water (snow) retention without adding additional weed control measures.

When planting into a low residue seedbed, completing the tillage and planting in a single operation or by performing primary tillage no more than three days before planting can minimize exposure to erosion; and in limited moisture areas, can conserve moisture for germination.

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 standing stubble taller than the 10-inch minimum will increase the amount of snow trapped and provide better protection to plants from freezing or desiccation.

The effectiveness of stubble to trap snow increases with stubble height. Increasing the stubble height beyond the minimum required will increase the amount of snow trapped.

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

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

Reducing Soil Particulate Emissions – In areas that are in non-attainment for PM₁₀, and for other areas with particular sensitivities to PM from dust, residue cover is especially important and should ensure that off-site PM levels are below critical thresholds, including maintenance of proper visibility.

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, or
- installing other practices to reduce wind erosion, such as Herbaceous Wind Barriers (code 603) or Cross Wind Trap Strips (code 589C).

Providing Food and Escape Cover for Wildlife – 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.

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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

and Considerations including crop rotation, tillage and planting system type, fertilizer placement and method of application, crop residue cover, timeframe and other appropriate management requirements Nebraska Conservation Planning Sheet No. 18 (Crop Rotation/ Residue Management/Gully Treatment), other Nebraska Conservation Planning Sheets, specification sheets, documentation.

Plans and specification shall document:

- Field number and acres
- Purpose(s) for this practice
- Crop Residue to be managed
- The method of how the residue will be managed (harvest, grazed, tilled)
- The time of the residue will be managed (harvest, grazed, tilled)
- The amount of residue removed by a harvest, grazing, or tillage
- The amount of residue to remain after a planned residue harvest, grazing, or tillage

OPERATION AND MAINTENANCE

Evaluate the effectiveness of the planned residue management to ensure the planned purpose(s) are being achieved. Adjust the management or choose an alternative technology if the management is not achieving the planned purpose(s).

Critical eroding areas (concentrated flow areas, or overland flow areas with inadequate cover) need to be stabilized with a cover crop, mulch,

run-off control structure or other acceptable method as identified in the conservation plan. Critical area treatment needs to be applied immediately following harvest (or immediately following seedbed preparation on newly sodbusted ground).

REFERENCES

Brady, C.N., and R.R. Weil. 2008. The nature and properties of soils. 14th ed.

Cadish, G., and K.E. Giller (ed). 1997. Driven by nature: plant litter quality and decomposition. CABI, Wallingford, UK.

NRCS Nebraska Conservation Planning Sheet No. 18 (Crop Rotation/ Residue Management/Gully Treatment):

http://efotg.nrcs.usda.gov/references/public/NE/PS18_Crop_Rotation_&_Residue_Mgt.pdf

NRCS Nebraska Conservation Planning Form, Cropland Habitat Evaluation Worksheet, NE-CPA-32:

[http://efotg.nrcs.usda.gov/references/public/NE/NE-CPA-32\(Cropland_Habitat_Worksheet\).pdf](http://efotg.nrcs.usda.gov/references/public/NE/NE-CPA-32(Cropland_Habitat_Worksheet).pdf)

Renard, K.G., G.R. Foster, G.A. Weesies, D.K. McCool, and D.C. Yoder, Coordinators. 1997. Predicting soil erosion by water: A guide to conservation planning with the Revised Universal Soil Loss Equation (RUSLE). U.S. Department of Agriculture, Agriculture Handbook No. 703.

Shaffer, M.J., and W.E. Larson (ed.). 1987. NTRM, a soil-crop simulation model for nitrogen, tillage and crop residue management. USDA Conserv. Res. Rep. 34-1. USDA-ARS.

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