NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

RESIDUE AND TILLAGE MANAGEMENT MULCH TILL

(Ac.)

CODE 345

DEFINITION

Managing the amount, orientation, and distribution of crop and other plant residue on the soil surface year round while limiting the soil-disturbing activities used to grow crops in systems where the entire field surface is tilled prior to planting.

PURPOSE

- Reduce sheet and rill erosion
- Reduce wind erosion
- Reduce soil particulate emissions
- Maintain or improve soil condition
- 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 tillage methods commonly referred to as mulch tillage or chiseling and disking. It applies to stubble mulching on summer-fallowed land, to tillage for annually planted crops and to tillage for planting perennial crops.

It also includes some planting operations, such as hoe drills, air seeders, and no-till drills that disturb a large percentage of the soil surface during the planting operation.

CRITERIA

General Criteria Applicable to All Purposes

All residues shall be uniformly distributed over the entire field.

Residue shall not be burned.

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 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 conservation management system.

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 Maintain or 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 Increase Plant-Available Moisture

Reducing Evaporation from the Soil Surface. A minimum of 2000 pounds per acre or 60 percent surface residue cover shall be maintained throughout the year.

Trapping Snow. Any fall tillage operation shall leave the crop stubble in an upright position.

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 percent of the field.

Fall tillage operations 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 Escape 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.

Harvest or tillage operations that disturb or cover the entire field shall not be performed during the nesting and brood-rearing period of the target species.

CONSIDERATIONS

General. Removal 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.

Mulch till may be practiced continuously throughout the crop sequence, or may be managed as part of a residue management system that includes other tillage methods such as no till.

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 in the rotation, use of cover crops and adjustment of plant populations and row spacing.

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 from the Soil. Where improving soil tilth is a concern, use of undercutting tools will enhance accumulation of organic material in the surface layer.

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 (one to three 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 tillage 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.

Increasing Plant-Available Moisture. 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.

Tillage and planting operations done on the contour will help slow overland flow and increase infiltration, thus increasing the potential for increased water storage in the root zone.

Providing Food and Escape Cover for Wildlife. Avoid disturbing standing stubble or heavy residue during the nesting season for ground-nesting species.

Forgoing fall shredding or tillage operations will maximize the amount of wildlife food and cover during critical winter months.

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.

PLANS AND SPECIFICATIONS

Specifications for establishment and operation of this practice shall be prepared for each field or treatment unit according to the criteria, considerations, and operation and maintenance 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

If row cultivation or tillage for weed escapes, leveling ruts, fracture of hard pans, or similar operations become necessary, it should be limited to deep ripping or shallow non-inversion tillage tools which minimize burial of surface residue. Leveling ruts and fracturing hard pans are best preformed during dry periods to avoid further compaction potential.

REFERENCES

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USDA Natural Resources Conservation Service. 2002. National Agronomy Manual. 190-V. 3rd Ed.

Revised Universal Soil Loss Equation Version 2 (RUSLE2) http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm

Tillage Equipment Pocket Identification Guide ftp://ftp-fc.sc.egov.usda.gov/IA/intranet/Tillage.pdf

Wind Erosion Equation (WEQ)

http://efotg.nrcs.usda.gov/treemenuFS.aspx?Fips=20169&MenuName=menuKS.zip Section 1 F. Erosion Prediction, Wind Erosion.