

**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 THIS 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
Stated Above**

Residue shall not be burned or disturbed by tillage operations except as follows:

- Disturb no more than one-third of the row width during seedbed preparation, planting, and fertilizer placement. The row area formed will be level with or slightly above the adjacent row middles unless the rows are planted on the contour.
- If row cultivation or spot treatment for weed escapes, leveling ruts, or similar operations becomes necessary, limit tillage to undercutting operations which minimize burial of surface residue.

Distribute residue uniformly over the entire field.

Production of adequate amounts of crop residue necessary to achieve the purposes of this practice can be enhanced by selection of high residue producing crops, such as corn, cotton, and sorghum, use of cover crops, such as rye, oats, and wheat, especially after low residue crops, such as peanuts, soybeans, and vegetables, or if the crop residue is removed, and adjustment of plant populations and row spacing.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

Combines or similar harvesting machines need to be equipped with spreaders capable of redistributing residues over at least 80 percent of the working width of the header.

Planters or drills need to be capable of planting directly through untilled residue or in a tilled seedbed prepared in a narrow strip along each row by the use of such planter attachments as rotary tillers, sweeps, multiple coulters, or row cleaning devices.

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

The annual Soil Tillage Intensity Rating (STIR) value shall be based on 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.

A minimum of 30 percent of the soil surface shall be covered by plant residue immediately following the planting of the crop. Follow the residue measuring techniques in the Florida Conservation Practice Standard 329 Guidance to determine adequate plant residue cover.

Additional specific requirements for no-till, strip-till, and direct seed can be found under the Plans and Specifications section of this standard.

Impact to cultural resources, wetlands, and Federal and State protected species needs to be determined prior to implementation of this practice. Any impacts need to be avoided or minimized to the extent practical during planning, design and implementation of this conservation practice in accordance with established National and Florida NRCS policy, General Manual (GM) Title 420-Part 401, Title 450-Part 401, and Title 190-Parts 410.22 and 410.26; National Planning Procedures Handbook (NPPH) FL Supplements to Parts 600.1 and 600.6; National Cultural Resources Procedures Handbook (NCRPH); and The National Environmental Compliance Handbook (NECH).

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 to reduce erosion to the planned soil loss objective. Calculations need to take into account the effects of other practices in the management system.

Additional Criteria to Reduce Wind Erosion

Use current approved wind erosion prediction technology to determine 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. These calculations need to take into account 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 STIR value shall be based on all field operations that are performed during the crop interval between harvest of the previous crop and harvest or termination of the current crop and shall be no greater 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 wind erosion prediction technology to determine 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). Calculations need to account for the effects of other practices in the management system.

Additional Criteria to Increase Plant Available Moisture**Reducing Evaporation from the Soil Surface.**

The annual STIR value for all soil–disturbing activities in the cropping system shall be no greater than 20.

Crop stubble height during the time that evaporation losses are 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.

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 wildlife species needs to be determined using an approved habitat evaluation procedure.

CONSIDERATIONS

General - Removing crop residue by activities such as haying or grazing, can have a negative impact on resources. Do not perform these activities without full evaluation of impacts on soil, water, animal, plant, and air resources.

No-till/strip-till/direct seed may be practiced continuously throughout the cropping sequence, or may be managed as part of a system which includes other tillage and planting methods such as mulch till. Selection of acceptable tillage methods for specific site conditions may be determined by using data from current approved erosion prediction technology.

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.
- Increased fuel savings and decreased equipment maintenance costs as a result of reduced or eliminated tillage.

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.

See Florida NRCS Conservation Practice Standard Field Border, Code 386, for further guidance.

Use of Precision Farming Technology, such as GPS steering and variable rate application, will reduce soil compaction and reduce rates of fertilizer and pesticides.

Increasing Soil Organic Matter Level and Reducing CO₂ Loss – CO₂ 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 CO₂ than deeper operations.
- When deep soil disturbance, such as subsoiling or fertilizer injection is performed 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 CO₂ 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 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.

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 Florida NRCS Conservation Practice Standards for Herbaceous Wind Barriers, Code 603 or Cross Wind Trap Strips, Code 589C.

Managing Soil Moisture – 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.

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.

PLANS AND SPECIFICATIONS

For each field or treatment unit, specifications and purpose of treatment need to be prepared and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan or other acceptable documentation. Include the following:

1. Width of tilled area
2. Acres planted
3. Percent of residue left after planting
4. Kind of residue

Determine residue amounts using the line transect method as described in the National Agronomy Manual and from additional instructions in the Florida Conservation Practice Standard 329 Guidance

- **No-Till/Strip-Till/Direct Seed Procedures**

The percent of the soil surface covered shall be in accordance with the definition of this practice. Residue can come from the previous crop, cover crop, winter/summer weeds, or a combination of cover types.

In the case of no-till and strip-till, injecting or knifing-in anhydrous or liquid fertilizer prior to planting is permissible. See Florida NRCS Conservation Practice Standard for Nutrient Management, Code 590.

Where pesticides are used, target them to specific problems. Pesticides will be used in accordance with the manufactures' label. Refer to University of Florida, Institute of Food and Agriculture Science (UF, IFAS) for specific pesticide recommendations by crop. See Florida NRCS Conservation Practice Standard for Pest Management, Code 595.

OPERATION AND MAINTENANCE

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

REFERENCES

National Cultural Resources Procedures Handbook (NCRPH)

National Environmental Compliance Handbook (NECH)

NRCS General Manual (GM)

Title 190, Part 410.22-Procedures for NRCS Assisted Programs

Title 190, Part 410.26-Protection of Wetlands

Title 420, Part 401-Cultural Resources

Title 450, Part 401-Technical Guides

National Planning Procedures Handbook (NPPH)

FL Supplements to Parts 600.1 and 600.6

National Agronomy Manual

Florida NRCS Conservation Practice Standards

Cover Crop, Code 340

Cross Wind Trap Strips, Code 589C

Field Border, Code 386

Herbaceous Wind Barriers, Code 603

Nutrient Management, Code 590

Pest Management, Code 595

University of Florida, IFAS – Pesticide Information Office