

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

**RESIDUE AND TILLAGE MANAGEMENT
RIDGE TILL**

(Ac.)

CODE 346

DEFINITION

Managing the amount, orientation, and distribution of crop and other plant residues on the soil surface year-round, while growing crops on pre-formed ridges alternated with furrows protected by crop residue.

PURPOSE

- Reduce sheet and rill erosion
- Reduce wind erosion
- Maintain or improve soil condition
- Reduce soil particulate emissions
- Manage snow to increase plant-available moisture
- Modify cool wet site conditions
- 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 and planting methods commonly referred to as ridge till or ridge planting. It does not include no-till planting on ridges, or bedding or listing operations that bury crop residues.

CRITERIA

General Criteria Applicable to All Purposes

Following crop harvest, residues shall remain on the surface until planting with no additional disturbance except for normal weathering.

Ridge height shall be maintained throughout the harvest and winter seasons by controlling equipment or livestock traffic.

After planting, residues shall be maintained in the furrows until the ridges are rebuilt by cultivation. Ridges shall be rebuilt to their original height and shape during the last row cultivation.

Stable Outlets. A stable outlet must exist where ridges direct runoff to areas of concentrated flow.

Maximum Row Grade. Row grades shall not exceed those given in the following table.

10-Year Storm Erosivity Index (EI)	Maximum Row Grade (%) ¹
<100	9
100 – 150	7
>150	6

¹ Based on existing water erosion prediction technology.

If irrigation is used with this practice, use the row grade limitation for the next higher 10-year storm EI value. Where residue cover is less than 30 percent, use the maximum row grade for the next higher 10-year storm EI value.

Additional Criteria to Reduce Sheet and Rill Erosion

Soil and residue removed from the top of the ridge shall be moved into the furrow between the ridges.

After planting, the top of the ridge shall be maintained at least 3 inches higher than the furrow between the ridges.

The ridge top shall be shaped to direct runoff to the protected furrow area.

Additional Criteria to Reduce Wind Erosion

Wind erosion calculations shall account for the effects of ridge height, spacing and orientation to the direction of erosive winds.

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.

Cultivation to rebuild ridges shall be done using tools that maintain residues in the surface layer.

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.

Reduce or modify agricultural cultural operations that create dust during critical air periods.

Adopt cultivation practices that reduce unnecessary trips across the field. Utilize tillage equipment that has proven to reduce particulate matter being generated.

Methods or procedures that reduce dust just prior to and during harvest should be considered.

Other operations to reduce dust shall be performed when specified on the Practice Requirements Sheet.

Additional Criteria to Manage Snow to Increase Plant-Available Moisture

During the time that significant snowfall is expected to occur, the minimum distance between the bottom of the furrow and the top of the stubble 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.

If this minimum distance cannot be achieved, ridges shall be oriented not to exceed 45 degrees from perpendicular to the prevailing wind direction during periods of expected snowfall.

Additional Criteria to Modify Cool Wet Site Conditions

Ridge height prior to planting shall be at least 6 inches.

Additional Criteria to Provide Food and Escape Cover for Wildlife

The amount of residue and height of stubble needed to provide cover during winter months shall be determined using an approved wildlife management plan. Stubble shall remain standing over winter.

CONSIDERATIONS

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

Ridge till may be practiced continuously throughout some crop sequences, or may be managed as part of a residue management system that includes other tillage and planting methods such as mulch till or no till. In mixed systems, ridges must be periodically re-established. Selection of acceptable tillage methods for specific site conditions may be aided by an approved Soil Tillage Suitability Rating.

Production of adequate amounts of crop residues 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 population and/or row spacing.

Since row cultivation is typically used for weed control and to reform ridges, this practice has the potential to reduce herbicide requirements.

A field border planted to permanent vegetation can assist in unobstructed turning, elimination of end rows and providing travel lanes for farming operations.

Leaving unharvested crop rows at intervals across the field can enhance the value of residue cover and food for wildlife.

Reducing soil particulate emissions -

Conservation tillage practices can reduce the number of required tillage operations across a field. Reducing the number of trips across the field results in a decreased amount of small soil particles emitted into the air. Economic benefits to the grower include less time required, and less fuel required.

With the use of ridge tillage it is possible to reduce the amount of small soil particles emitted into the air as a result of tilling only 20-30% of the soil surface.

Use tillage methods and/or equipment that have been proven to reduce particulate matter generation. (Example: multiple tillage practices completed in one pass or use of one pass tillage equipment.) Using fewer trips across the field will reduce the amount of particulates, NO_x and VOCs from internal combustion engines.

Maintaining or Improving Soil Condition and Reducing CO₂ Loss from the Soil -

Continuous ridge planting will allow organic material to accumulate in the surface horizon. Reconstruction of ridges in the same row area year after year will maximize organic matter buildup and biological activity in the row.

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.

- Shallow soil disturbance (1-3 inches) releases less CO₂ 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 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.

Soil compaction may be reduced by controlled traffic, in which wheel traffic from all operations

is limited to the area between designated rows or traffic areas.

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.

CULTURAL RESOURCES CONSIDERATIONS

NRCS policy is to avoid any effect to cultural resources and protect them in their original location. Determine if installation of this practice or associated practices in the plan could have an effect on cultural resources. The National Historic Preservation Act may require consultation with the California State Historic Preservation Officer.

<http://www.nrcs.usda.gov/technical/cultural.html> is the primary website for cultural resources information. The California Environmental Handbook and the California Environmental Assessment Worksheet also provide guidance on how the NRCS must account for cultural resources. The e-Field Office Technical Guide, Section II contains general information, with Web sites for additional information.

Document any specific considerations for cultural resources in the design docket and the Practice Requirements worksheet.

ENDANGERED SPECIES CONSIDERATIONS

If during the Environmental Assessment NRCS determines that installation of this practice, along with any others proposed, will have an effect on any federal or state listed Rare, Threatened or Endangered species or their habitat, NRCS will advise the client of the requirements of the Endangered Species Act and recommend alternative conservation

treatments that avoid the adverse effects. Further assistance will be provided only if the client selects one of the alternative conservation treatments for installation; or with concurrence of the client, NRCS initiates consultations concerning the listed species with the U.S. Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game.

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

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

REFERENCES

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- Shaffer, M.J., and W.E. Larson (ed.). 1987. Tillage and surface-residue sensitive potential evaporation submodel. *In* NTRM, a soil-crop simulation model for nitrogen, tillage and crop residue management. USDA Conserv. Res. Rep. 34-1. USDA-ARS.
- Skidmore, E.L. and N.P. Woodruff. 1968. Wind erosion forces in the United States and their use in predicting soil loss. U.S. Department of Agriculture. Agriculture Handbook No. 346.
- U.S.D.A. Natural Resources Conservation Service. 2002. National Agronomy Manual. 190-V. 3rd ed.