



NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

STRIPCROPPING

CODE 585 (AC.)

DEFINITION

Growing planned rotations of [erosion-resistant](#) and [erosion susceptible](#) crops or fallow in a systematic arrangement of strips across a field.

PURPOSE

This practice may be applied as part of a conservation management system to support one or more of the following purposes:

- Reduce water erosion – Resource Concern (SOIL EROSION - Sheet, rill, & wind erosion)
- Reduce wind erosion – Resource Concern (SOIL EROSION - Sheet, rill, & wind erosion)
- Reduce the transport of sediment and other water and wind borne contaminants – Resource Concerns (Excess nutrients in surface and ground waters and WATER QUALITY DEGRADATION – Pesticides transported to surface and ground waters)
- Protect growing crops from damage by wind-borne soil particles – Resource Concern (DEGRADED PLANT CONDITION – Undesirable plant productivity and health)

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on cropland.

CRITERIA

General Criteria Applicable to All Purposes

- Soil erosion shall be equal to or less than Tolerable levels as calculated utilizing the appropriate approved soil erosion prediction model.
- Strips of crops susceptible to erosion shall be alternated with strips of erosion-resistant crops
- The alternating crop rotation shall be followed on each adjacent strip to achieve the desired conservation planning objective.
- The orientation shall be at angles as close as practical to perpendicular to the critical wind and water erosion vectors.

Number of Strips and Strip Width

- A stripcropping system shall consist of two or more equal width strips in an alternating sequence of erosion-susceptible and erosion-resistant crops.

- Strip width shall be determined by the current erosion prediction tool and will not exceed the critical [slope length](#) for contouring.
- Strip widths shall be multiples of the width of the planting equipment and not narrower than the widest implement used.
- Soil loss shall account for the effects of other practices in the conservation management system.
- A minimum of two full strips must be planned on the “L” (slope length).

Alignment of Strips

- Strip boundaries shall run parallel to each other and as close to the [contour](#) as practical.
- Irregular correction strips may occur between adjoining contour strip cropping layouts as needed to adjust for changes in the land form. Normally an odd shaped cropped area will occupy the top and bottom of the hill or along the edges of fields.
- Sod turn strips will be used when contours become too sharp to keep machinery on contour. Establish sod turn strips on sharp ridge tops and/or valleys. Turn strips will be wide enough to allow equipment to be lifted or turned to meet the same rows across the turn strip.

Minimum Row Grade

- The crop rows shall have sufficient grade to ensure that runoff water does not pond and cause unacceptable crop damage. Soils with very slow infiltration rates (hydrologic groups C and D) will have a minimum absolute row grade of 0.2 percent on slopes where ponding is probable.

Maximum Row Grade

- The maximum grade of rows shall not exceed 4 percent or one half of the up and down hill slope percent used for erosion prediction, whichever is less.
- Up to a 25 percent deviation is permitted within 150 feet of a stable outlet such as a grassed waterway, field border, or other stable outlet.
- When the row grade exceeds the maximum allowable design criteria, a new [keyline](#) shall be established and used for layout of the adjoining contour pattern. All tillage and planting operations will follow the established contour line.

Stable Outlets

- Surface water flow from contour strip crop rows must be delivered to a stable outlet. Stable outlets for ephemeral gullies or concentrated flow channels include areas with established critical area seeding, grassed waterways, terraces, diversions, or water and sediment control basins.
- Headlands and end rows shall be protected from erosion when:
 - o the contour strip-cropping layout delivers runoff water toward the headland/end row, and
 - o the contour strip-cropping layout row grade toward the end rows is steeper than 4 percent.

Note: Field borders where utilized to protect end rows shall be sufficient width to accommodate turning farm equipment without additional end rows.

Vegetative Cover

- Vegetation in a strip-cropping arrangement consists of an alternating pattern of row crops and forages or other erosion-resistant crops grown in a planned rotation. At least 50 percent of the rotation shall consist of an erosion resistant cover.
- No two adjacent strips shall be in an erosion-susceptible condition at the same time during the year. However, two adjacent strips may be in erosion-resistant cover at the same time. Stagger the crop rotation to achieve this goal.
- A vegetative cover shall be selected that is tolerant of the anticipated depth of sediment deposition.
- When the erosion-resistant strip is in permanent vegetation, the species established shall either be tolerant to herbicides used on the cropped strips or protected from damage by herbicides used on the cropped strips.

Additional Criteria to Reduce Soil Erosion from Water and Transport of Sediment and Other Waterborne Contaminants

- If it is not feasible to establish a contour strip layout utilizing multiple strip widths, the width of strips for the overall pattern shall be established utilizing a representative planning slope steepness and length that adequately protects the more erosive portions of the field.
- The need for additional water management practices shall be assessed when designing the strip width. Structural or management practices to supplement strip-cropping are required where ephemeral gullies can be expected to form within a cropped strip before reaching the vegetated strip due to excessive slope length or steepness.
- The row grade of the cropped strip shall be aligned as closely as possible to the contour to achieve the greatest erosion reduction possible. The grade along the upslope side of the vegetated buffer shall be the same as for the cropped strip directly above it.

Additional Criteria to Protect Growing Crops from Damage by Wind-borne Soil Particles

Orientation and Width of Strips

- The width of strips shall not exceed the width permitted by the crop tolerance to wind erosion during specific crop stage periods using current wind erosion prediction technology. Refer to crop tolerances as specified in the National Agronomy Manual or other accepted technical references. Increase strip width as defined by wind erosion prediction model.
- Evaluate the potential for incoming saltation and the sediment storage capacity of barriers during the design process. Design strips perpendicular to critical wind erosion direction for the susceptible period.

Note: Alternative practices that may be used to separate erosion-susceptible strips include cross wind ridges, herbaceous wind barriers, or windbreak/shelterbelt establishment.

CONSIDERATIONS

- Prior to design and layout, obstruction removal or changes in field boundaries should be considered, to improve the effectiveness of the practice and the ease of performing field operations across the slope.

- Prior to layout, inspect the field to find key points for commencing layout or getting a full strip width to pass by an obstruction or ridge saddle. Whenever possible, run the strip boundary parallel with fence lines or other barriers, as long as row gradient criteria are met. Account for access road widths when they must cross the field, and adjust the strip boundary on either side accordingly.
- Consider the need for water management practices (terraces, diversions, structures for water control) when surface water runoff flows downhill through two or more contiguous slope lengths (L).
- When this practice is used in combination with diversions or terraces, coordinate the strip layout with the diversion or terrace grade and spacing so that strip boundaries will parallel terraces wherever possible within the criteria for row grade. Where grass-back or narrow-base terraces are used or planned, allow for sufficient area to be occupied by the terrace during the strip layout so that the same strip width is maintained for all strips in the field.
- Retain as much crop residue as possible on the soil surface of the erosion susceptible strips by using residue management practices. When row crops maintain heavy residue most of the year, there is little sediment delivered to the protective cover strips.
- Wildlife and pollinator habitat can be enhanced by delaying mowing or forage harvest until after the nesting season. Also consider selecting species that provide habitat for pollinators and wildlife.
- To avoid wide fluctuations in acres of different crops each year, the conservation crop rotation on strip-cropped fields should contain equal years of row and forage crops and must be consistent with the farm enterprise crop needs.
- Strip cropping may need to be used in combination with other conservation practices to meet the goals of the resource management system.
- To capture and manage soil moisture, select crops, crop sequence, and varieties with sufficient density and cover to intercept runoff and/or blowing snow. Manage the height of standing residues to maximize snow trapping potential.
- Stable outlets may be necessary where runoff results in concentrated flow erosion. Acceptable stable outlets include grassed waterways, field borders, filter strips, water and sediment control basins, or underground outlets for terraces and diversions.
- When the erosion-resistant strip is living vegetation, the species established on non-organic operations, should either be tolerant to herbicides used on the cropped strips or protected from damage by herbicides used on the cropped strips.

PLANS AND SPECIFICATIONS

Specifications for installation, and maintenance of strip-cropping shall be prepared for each field according to the criteria described in this standard, and shall be recorded on specification sheets, job sheet 585 Stripcropping. Plans shall include:

- A statement of practice design objective determined by the client;
- the percent land slope and slope length (L) used to plan the practice;
- the minimum and maximum allowable row grades for the strip-cropping system;
- an estimate of before and after soil loss;
- the design width of strips;
- the actual width of strips as installed; and
- a sketch, plan map, and photograph of the field showing:

- the approximate location of the keyline(s) used to establish the system,
- the location of stable outlets and outlets and/or headlands needing treatment identified during the design of the contour buffer system, and
- the location of all existing or planned supporting conservation practices needed to control surface water runoff.

OPERATION AND MAINTENANCE

- Sediment accumulations along strip edges shall be smoothed or removed and distributed over the field as necessary to maintain practice effectiveness.
- Mow sod turn strips at least once a year to maintain vigorously growing vegetative cover and to control encroachment by woody vegetation.
- When headlands are in permanent cover, renovate as needed to keep ground cover above 65 percent. Maintain full headland width to allow turning of farm implements at the end of a tilled strip to double back on the same strip.
- If strip alignment is lost due to adjacent hay strips, the original strip alignment and width will be re-established before row crop strips are planted.
- Erosion-resistant strips in rotation shall be managed to maintain the planned vegetative cover and surface roughness during periods when wind erosion is expected to occur.
- The protective cover must be adequate to inhibit the initiation of wind erosion and the surface roughness will be sufficient to trap saltating soil particles originating upwind.

FEDERAL, TRIBAL, STATE, AND LOCAL LAWS

Users of this standard should be aware of potentially applicable federal, tribal, state and local laws, rules, regulations or permit requirements governing herbaceous weed control. This standard does not contain the text of federal, tribal, state, or local laws.

REFERENCES

Foster, G. R., Revised Universal Soil Loss Equation, Version 2 (RUSLE2), Science Document, USDA-ARS, Washington DC, 2005.

Renard, K. G. Foster, G. A. Weesies, D. K. McCool, and D. C. Yoder, Coordinators. Predicting Soil Erosion by Water: A Guide to Conservation Planning with the Revised Soil Loss Equation (RUSLE), USDA, Agriculture Handbook 703, 1997.

USDA, ARS. 2006. The wind erosion prediction system, (WEPS ver. 1.3.9), User Manual, 2011 Wind Erosion Research Unit, Manhattan, Kans.

USDA, NRCS Wisconsin Field Office Technical Guide (FOTG), Section IV, Practice Standards and Specifications.

USDA, NRCS, National Agronomy Manual.

Woodruff, N.P., Lyles, L., Siddoway, F.H. and Fryrear, D.W., 1972. How to Control Wind Erosion. USDA, ARS. Agricultural Information Bulletin No. 354

DEFINITIONS

Contour – A line or tillage pattern established generally perpendicular to the field slope.

Erosion resistant – An erosion-resistant strip generally consists of dense grasses and/or legumes. Densely planted small grains such as oats, barley, or rye are also considered erosion resistant.

Erosion susceptible – Erosion-susceptible strips are generally defined as consisting of narrow or wide spaced row crops or fallow with less than 10 percent surface residue cover and little surface roughness during the period of time when erosion potential is the greatest.

Keyline – The baseline used for the establishment of a contour farming layout and is in the field on the most uniform area (mid-point) of the hillside slope segment to be protected.

Slope Length – Slope length, as defined by the currently approved sheet and rill soil erosion prediction technology, starts where downslope surface water flow begins to occur and ends where soil deposition occurs or runoff concentrates into ephemeral gullies or a concentrated flow channel.

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