

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
CONSERVATION CROP ROTATION

(Ac.)

CODE 328

DEFINITION

A planned sequence of crops grown on the same ground over a period of time (i.e. the rotation cycle).

PURPOSE

This practice is applied to support one or more of the following purposes:

- Reduce sheet and rill, and wind erosion
- Maintain or increase soil health and organic matter content
- Reduce water quality degradation due to excess nutrients
- Improve soil moisture efficiency
- Reduce the concentration of salts and other chemicals from saline seeps
- Reduce plant pest pressures
- Provide feed and forage for domestic livestock
- Provide food and cover habitat for wildlife, including pollinator forage and nesting

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cropland where at least one annually planted crop is included in the crop rotation.

CRITERIA

General Criteria Applicable to All Purposes

Crops shall be grown in a planned sequence as outlined in Plans and Specifications. The crop rotation shall include a minimum of two different crops. For purposes of these criteria, a cover crop is considered a different crop in the rotation.

Where applicable, plan suitable crop substitutions when the planned crop cannot be planted due to weather, soil conditions, or other local situations.

Additional Criteria to Reduce Sheet and Rill, and Wind Erosion

Select crops, a tillage system and cropping sequences that will produce sufficient and timely quantities of biomass or crop residue, which, in conjunction with other practices in the management system, will reduce sheet and rill, and wind erosion to the planned soil loss objective.

Determine the amount of biomass or crop residue needed using current approved erosion prediction technology.

Additional Criteria to Maintain or Increase Soil Health and Organic Matter Content

Grow crops that will produce a positive trend in the Organic Matter (OM) subfactor value over the life of the rotation, as determined by the Soil Conditioning Index. Make appropriate adjustments for additions to or subtractions from biomass.

Additional Criteria to Reduce Water Quality Degradation Due to Excess Nutrients

To recover excess nutrients from the soil profile, use crops with the following characteristics.

- Quick germination and root system formation
- A rooting depth sufficient to reach the nutrients not removed by the previous crop
- Nutrient requirements sufficient to utilize excess nutrients

Credit nutrients provided by legumes and manure/compost, to the nutrient budget.

Additional Criteria to Improve Soil Moisture Efficiency

The selection of crops and varieties, sequence of crops or the annual decision to plant a crop or to fallow, shall be determined based on local climate patterns, soil conditions, irrigation water availability and an approved water balance procedure.

Additional Criteria to Reduce the Concentration of Salts and Other Chemicals from Saline Seeps

Select crops for saline seep recharge areas that have sufficient rooting depths and water requirements to utilize all plant available soil water. Do not summer fallow recharge areas. Crop selection and sequence shall be determined using an approved water balance procedure.

If excess subsoil moisture exists below the rooting depth of crops commonly grown in the recharge area, establish deep-rooted perennial crops for the number of years needed to dry the soil profile.

Select crops for discharge areas of saline seeps based on their tolerance to salinity levels in the discharge area.

Additional Criteria to Reduce Plant Pest Pressures

Design the crop sequence to break pest lifecycles and/or to allow the use of a variety of control methods.

Remove susceptible crops and alternate host crops from the rotation for the period needed to break the life cycle of the targeted pest.

Select resistant varieties from appropriate university publications or other approved sources, where there is a history of a pest problem.

Additional Criteria to Provide Feed and Forage for Domestic Livestock

Select crops that balance the feed supply with livestock numbers. Determine the required amount of selected crops using an approved forage-livestock balance procedure.

Additional Criteria to Provide Food and Habitat for Wildlife, Including Pollinator Forage and Nesting

Select the crops and crop management activities that provide either food or cover for the targeted wildlife species using an approved habitat evaluation procedure.

CONSIDERATIONS

When used in combination with NRCS Conservation Practice (CPS) Stripcropping (Code 585), the crop sequence should be consistent with the stripcropping design.

Decrease soil compaction by adjusting crop rotations to include crops with deep roots that extend to and penetrate compacted soil layers.

Where improving water use efficiency on deep soils is a concern, rotating or combining deep-rooted crops with shallow rooted crops can help utilize all available water in the soil profile.

Select crops that have the potential to fix large amounts of nitrogen.

Considerations to Reduce Water Quality Degradation Due to Excess Nutrients

Include perennial or annual legume crops in the rotation to provide nitrogen for the non-legume crops, especially in fields where manure applications are restricted by high or excessive soil phosphorus or potassium levels.

Return crop residues to the soil that have a carbon/nitrogen ratio of 25:1 to 35:1, throughout the rotation. This range of carbon/nitrogen ratios can help build the soil's capacity to provide slow-release N to crops while minimizing N leaching.

Considerations to Increase Cropping System Diversity

Minimize fallow periods where climate and soils are favorable for continuous cropping or the establishment of cover crops during fallow periods.

To increase crop diversity, the planned crop sequence should include different crop types; for example a mix of the following: warm season grass; warm season broadleaf; cool season grass; cool season broadleaf.

- A two-crop sequence that includes a warm season and a cool season crop;

- A three-crop sequence that includes warm and cool season crops. The same crop species should not be grown in successive years in the same field.
- A four-crop sequence that includes two different crop types, neither should occupy more than half of the sequence;
- Longer crop sequences (four or more years) are more effective with no more than two consecutive years with the same crop;
- In tropical regions or regions with distinct wet and dry seasons (Mediterranean climate), grass crops should alternate with broadleaf crops.

Additional Considerations to Reduce Sheet and Rill or Wind Erosion

When used in combination with Residue and Tillage Management practices, the selection of high-residue producing crops and varieties, use of cover crops and adjustment of plant density and row spacing, can enhance production of the kind, amount and distribution of residue needed.

When used in combination with Stripcropping or Contour Buffer Strips on steeper slopes, the effectiveness of each practice is significantly enhanced by inclusion of the other practice(s) in the conservation system.

To decrease crop damage by wind erosion, selecting crops that are tolerant to abrasion from windblown soil, or tolerant to high wind velocities.

If crops sensitive to wind erosion damage are grown, decrease plant damage by crop residue management, field windbreaks, herbaceous wind barriers, intercropping, or other methods of wind erosion control.

Additional Considerations to Improve Soil Health

Consider including perennial sod crops with deep or extensive fibrous root systems to build organic matter throughout the soil profile.

In semiarid regions, where seasonal fallow is often used to store moisture in the soil for a subsequent crop, consider leaving sufficient residues to protect the soil surface during fallow, or growing a shallow-rooted cover crop that allows deep moisture storage. Reduce the intensity of tillage and increase soil surface coverage with vegetation and crop residues.

The effects of this practice can be enhanced by utilizing animal wastes, green manure crops (cover crops), or applying non-synthetic mulches to supplement the biomass produced by crops in the rotation.

Other considerations for soil health/organic matter management include:

- For at least one-third of the crop sequence (time basis) include high-biomass annual or perennial crops.
- Utilize cover crops and high residue production crops comprising at least one-half of the rotation sequence.
- For rotations dominated by low-residue crops such as vegetables, include sufficient cover crops and high residue crops for one-half the rotation.

Additional Considerations to Reduce Plant Pest Pressures

Consider lengthening the rotation to include several years of perennial cover to break pest life cycles.

Use a mix of crops from at least three different plant families, and allow three years or longer between successive plantings of production crops within the same family.

Enhance biological pest control by designing the crop rotation to:

- Include flowering annuals or perennials that provide food and habitat for beneficial insects, such as buckwheat, clovers, or Phacelia.
- Include plant species that release into the soil natural substances that suppress plant pathogens, nematodes or pests (biofumigation).
- Include crops in the rotation that provide habitat for natural enemies of pests.
- Retain bolting or flowering crops after harvest to provide food for beneficial insects.

Additional Considerations to Provide Food and Cover Habitat for Wildlife, Including Pollinator Forage, and Nesting

Crop residues may be a valuable food source for wintering wildlife where winter browse is sparse. Leaving several rows unharvested around the edges of the field, or planting borders of various forbs will provide protection and/or food for overwintering wildlife and for beneficial insects and pollinators.

Crop plantings may be developed to benefit particular communities, species, or life stages of wildlife. Food plots or crops for wildlife can provide part of a habitat restoration, an initial food and cover for wildlife until food and cover producing vegetation becomes established.

Retaining bolting or flowering crops after harvest may provide beneficial insects with an important food source.

Careful consideration should be given to pesticides applied to crops raised for wildlife, particularly if nesting habitat or pollinator forage species are present.

When insect-pollinated crops are part of the rotation, planting the insect-pollinated crop no more than 800 feet from their previous location may help maintain local populations of native bees that have become established because of the presence of that crop.

To maintain stable pollinator and beneficial insect populations, ensure that the same overall density of floral resources is maintained from year-to-year. For example two years of flower-rich plantings, followed by a year of only grasses, will cause a rapid decline in pollinator populations. Such a scenario is undesirable.

PLANS AND SPECIFICATIONS

Develop plans and specifications for each field or treatment unit according to the Criteria and Operation and Maintenance requirements of this standard. Specifications shall describe the requirements to apply this practice to achieve the intended purpose.

Record practice specification within a Colorado Conservation Crop Rotation 328, Implementation Requirements worksheet.

Plans and Specifications shall include the following components, as a minimum.

- Field number and acres
- Purpose(s) for the crop rotation
- The sequence of crops to be grown
- The crop types to be grown
- Tillage type and timing of operations
- Length of time each crop/crop type will be grown in the rotation, and total length of rotation
- Suitable crop substitutions to address weather, soil conditions, market, or other situations that may prevent the planned crop from being planted

OPERATION AND MAINTENANCE

Rotations shall provide for acceptable substitute crops in case of crop failure or shift in planting intentions for weather related or economic reasons. Acceptable substitutes are crops having similar properties that will accomplish the purpose of the original crop. Evaluate the rotation and the crop sequence to determine if the planned system is meeting the planned purposes.

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