

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

CONSERVATION CROP ROTATION

(Acre)

CODE 328

DEFINITION

Growing crops in a planned sequence on the same field.

PURPOSES

This practice may be applied to support one or more of the following:

- Reduce water or wind erosion.
- Improve soil quality.
- Manage the balance of plant nutrients.
- Increase cropping system diversity.
- Manage crop consumptive use of water.
- Manage saline seeps.
- Manage plant pests (weeds, insects, and diseases).
- Provide food for domestic livestock.
- Provide food and cover for wildlife, including pollinator forage, cover, and nesting.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land where annually-planted crops make up at least one-third of the crop sequence.

For the purposes of this practice, a cover crop is considered a crop in the rotation.

CRITERIA

General Criteria Applicable to All Purposes

Use of this standard will comply with all applicable federal, state, and local laws and regulations.

Known invasive species will not be used.

Crops will be grown in a planned sequence as outlined in Plans and Specifications.

The crops grown will produce the required "maintenance amount" of biomass or residue over the life of the rotation, as determined in the OM (Organic Matter) subfactor of the Soil Conditioning Index procedure, with appropriate adjustments for additions to or subtractions from biomass on the field.

Additional Criteria to Improve Soil Quality

The crops grown will produce the amount of plant biomass needed to increase soil organic matter content, as determined using the current approved Soil Conditioning Index Procedure or as demonstrated in published research papers.

Fallow years will not occupy more than 25% of the planned crop sequence.

Crop types include warm season grass (WSG), warm season broadleaf (WSB), cool season grass (CSG) and cool season broadleaf (CSB).

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service State Office, or download it from the Field Office Technical Guide for your State.

Table 1. Typical Crop Types. Additional similar crops may also be used.

Perennial Cover <u>1/</u>	Type	High Residue Crops <u>2/</u>	Type	Cover Crops <u>3/</u>	Type
Alfalfa	WSB	Barley	CSG	Radish, forage, oilseed	CSB
Alsike Clover	CSB	Corn (grain)	WSG	Alsike Clover	CSB
Birdsfoot Trefoil	WSB	Millet	WSG	Annual Ryegrass	CSG
Kentucky Bluegrass	CSG	Milo	WSG	Barley	CSG
Lespedeza, Korean, common	WSB	Oats	CSG	Buckwheat	WSB
Orchardgrass	CSG	Popcorn	WSG	Canola/rape	CSB
Perennial Ryegrass	CSG	Rye	CSG	Cowpeas	WSB
Red Clover	WSB	Sorghum	WSG	Crabgrass (red river)	WSG
Redtop	CSG	Sorghum-	WSG	Crimson Clover	CSB
Smooth Brome	CSG	Sudangrass Hybrids	WSG	Field Peas/winter peas	CSB
Tall Fescue	CSG	Triticale	CSG	Hairy Vetch	CSB
Timothy	CSG	Wheat	CSG	Oats	CSG
White Clover	CSB	Low Residue Crops		Red Clover	WSB
Canada Wildrye	CSG	Soybean	WSB	Rye	CSG
Riverbank Wildrye	CSG	Tomatoes	WSB	Sorghum-Sudangrass Hybrids	WSG
Virginia Wildrye	CSG	Melons	WSB	Sweetclover	CSB
Big Bluestem	WSG	Corn (silage)	WSG	Triticale	CSG
Prairie Dropseed	WSG	Vegetables	WSB	turnips	CSB
Eastern Gamagrass	WSG	Potatoes	WSB	Wheat	CSG
Indiangrass	WSG				
Little Bluestem	WSG	1/ Grown for two years or more.		3/ Cover to be established early enough in growing season to provide adequate root growth, biomass and/or cover.	
Sideoats Grama	WSG	2/ Full-season crops managed to leave 50 percent or more residue cover. Not harvested for silage or biomass.			
Switchgrass	WSG				
Native Forbs and Legumes	WSB				

The planned crop sequence will contain different crop types as specified below:

- A two-crop sequence must contain a warm season and a cool season crop; (i.e.-Corn-Wheat or Corn-Winter Cover Crop- Corn)
- A three-crop sequence must contain a warm season and a cool season crop type, neither of which crop species may be grown in consecutive years;(i.e.-Corn-Soybean-Wheat) (i.e. 3 different crops in 3 different years)
- A four-crop sequence must contain two different crop types, neither of which may occupy more than half of the sequence. (i.e.-Corn-Soybean-Wheat-Clover)

- Longer crop sequences may have more than two consecutive years of the same crop type, as long as that crop type does not occupy more than $\frac{2}{3}$ of the crop rotation. (i.e.-Corn-Corn-Soybean-Soybean-Wheat-Cover Crop)

Additional Criteria to Manage the Balance of Plant Nutrients

Crop selection and sequence will be determined using an approved nutrient balance procedure.

When crop rotations are designed to add nitrogen to the system, nitrogen-fixing crops will be grown immediately prior to or interplanted with nitrogen-depleting crops.

To reduce excess nutrients in the soil profile, use crops with:

- quick germination and root system formation,
- a rooting depth sufficient to reach the nutrients not removed by the previous crop, and
- nutrient requirements such that they can readily use the excess nutrients.

Additional Criteria to Manage Crop Consumptive Use of Water

Select crops and varieties and the sequence of crops on local climate potential and/or irrigation water availability, and an approved water balance procedure.

Additional Criteria to Manage Saline Seeps

Select crops to be grown in the recharge area of saline seeps that have rooting depths and water requirements adequate to fully use all plant available soil water. Do not use summer fallow. Crop selection and sequence will 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, deep-rooted perennial crops will be established for the number of years needed to dry the soil profile.

Crops grown in the discharge area of saline seeps will be selected for their tolerance to salinity levels in the discharge area.

Additional Criteria to Manage Plant Pests (Weeds, Insects, Diseases)

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

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

Resistant varieties, listed in appropriate university publications or other approved sources, will be selected where there is a history of a pest problem.

Additional Criteria to Provide Food 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 Cover for Wildlife

Select the crops and crop management activities that provide either food or cover for the targeted wildlife species. Refer to IN NRCS Biology Technical Note: Upland Wildlife Habitat for guidance.

CONSIDERATIONS

When used in combination with Stripcropping (practice code 585), the crop sequence should be consistent with the stripcropping design.

Soil compaction can be reduced by adjusting crop rotations to include deep rooted crops that are able to extend to and penetrate the compacted soil layers.

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

Where pesticides are used, use a combination of pesticide application methods and crop rotation to reduce the potential for pesticide carryover or adverse affects on aquatic wildlife or habitat through runoff.

Biological control of various crop pests can be provided by:

- diverse crop rotations
- the use of field borders with diverse, insect-friendly species
- intercropping of species that provide forage and nesting resources for beneficial insects.

Additional Considerations to Reduce Sheet and Rill or Wind Erosion.

When used in combination with the Residue and Tillage Management practices (practice codes 329, 345, and 346), selection of high-residue producing crops and varieties, use of cover crops and adjustment of plant population

and row spacing can enhance production of the kind, amount, and distribution of residue needed.

Crop damage by wind erosion can be reduced with this practice by selecting crops that are tolerant to abrasion from wind blown soil or tolerant to high wind velocity.

If crops sensitive to wind erosion damage are grown, the potential for plant damage can be reduced by crop residue management, field windbreaks, herbaceous wind barriers, intercropping, or other methods of wind erosion control.

Additional Considerations to Improve Soil Quality

Soil organic matter levels are more sensitive to tillage than to long rotations with perennial vegetation. Therefore, reducing or eliminating tillage from a management system will increase soil organic matter quicker than rotations with several years of perennial vegetation.

Growing high residue crops will have a greater affect on increasing soil organic matter and increasing the Soil Conditioning Index.

The effects of this practice can be enhanced by using animal wastes or applying mulches to supplement the biomass produced by crops in the rotation.

Additional Considerations for Wildlife, Beneficial Insects, and Pollinators

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 could be provided as part of a habitat restoration project as an initial food and cover source for wildlife until food and cover producing vegetation becomes established.

Retaining bolting or flowering crops for some time after harvest may provide beneficial

insects with an important nectar source when and where pests are active.

Careful consideration should be given to pesticide use if 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 them 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

Plans and specifications will include:

- Plan view
- field number and acres
- purpose(s) of the crop rotation
- the sequence of crops to be grown
- the crop types to be grown
- length of time each crop/crop type will be grown in the rotation, and
- total length of rotation

Specifications will be recorded using approved specification sheets, job sheets, narrative statements in the conservation plan, or other acceptable.

OPERATION AND MAINTENANCE

Rotations will 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.

REFERENCES

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