

CONSERVATION CROP ROTATION

(Acre)
Code 328

Natural Resources Conservation Service
Conservation Practice Standard

I. Definition

Growing crops in a recurring sequence on the same field.

II. Purposes

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

- Reduce sheet and rill or wind erosion.
- Maintain or improve soil organic matter content.
- Manage the balance of plant nutrients.
- Manage plant pests (weeds, insects, and diseases).
- Provide food for domestic livestock.
- Provide food and cover for wildlife.
- Supply nitrogen through biological nitrogen fixation to reduce energy use.
- Conserve water.
- Provide annual crops for bioenergy feedstocks.
- Provide food and cover for wildlife, including pollinator forage, cover, and nesting.

III. Conditions Where Practice Applies

This practice applies to all land where crops are grown, in a regularly reoccurring cropping sequence. It does not apply to renovation of long term pasture or hay land.

IV. 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 conservation crop rotation. This standard does not contain the text of federal, tribal, state, or local laws.

V. Criteria

A. General Criteria Applicable to All Purposes

Crops shall be grown in a planned, recurring sequence as outlined in Plans and Specifications.

Crops shall be adapted to the climatic region, the soil resource, and the goals of the producer.

Adapted crops and varieties listed in appropriate university publications or other approved sources shall be selected.

B. Additional Criteria to Reduce Soil Erosion

When soil erosion control is a primary goal, crops shall be selected that produce sufficient quantities of biomass at the appropriate time to reduce erosion by water or wind to within acceptable soil loss levels. In those instances where crops selected do not produce sufficient biomass to meet this criteria, a cover crop (see Wisconsin NRCS Field Office Technical Guide [FOTG], Section IV, Standard 340, Cover Crop) or other appropriate practices shall be used. The amount of biomass needed shall be determined using current approved erosion prediction technology found in the NRCS FOTG. Soil loss estimates shall account for the effects of all tillage, harvest methods, and other practices in the conservation management system.

C. Additional Criteria to Maintain or Improve Soil Organic Matter Content

Crops shall be selected that produce the amount of plant biomass needed to maintain or improve soil organic matter content, as determined using the current approved Soil Conditioning Index Procedure or determined by approved research.

If partial removal of residue by means such as baling or grazing occurs, enough residue shall be maintained to achieve the desired soil organic matter content goal.

Cover and green manure crops planted specifically for soil improvement may be grazed, as long as grazing is managed to retain adequate biomass.

D. Additional Criteria to Manage the Balance of Plant Nutrients

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

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

To reduce excess nutrients, crops or cover crops having rooting depths and nutrient requirements that utilize the excess nutrients shall be grown.

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

Crops shall be alternated to break the pest cycle and/or allow for the use of a variety of control methods. Affected crops and alternate host crops shall be removed 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, shall be selected where there is a history of a pest problem.

F. Additional Criteria to Provide Food for Domestic Livestock

Crops shall be selected to balance the feed supply with livestock numbers. The needed amount of selected crops shall be determined using an approved forage-livestock balance procedure.

G. Additional Criteria to Provide Food and Cover for Wildlife

Crop selection to provide either food or cover for the targeted wildlife species will be grown, managed, or left unharvested as per the needs of the targeted wildlife as determined by an approved habitat evaluation procedure.

H. Additional Criteria to Supply Nitrogen Through Biological Nitrogen Fixation to Reduce Energy Use

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

I. Additional Criteria to Conserve Water

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

V. Considerations

Additional recommendations relating to design that may enhance the use of, or avoid problems with, this practice but are not required criteria to ensure its basic conservation functions are as follows.

A. General

When used in combination with Wisconsin NRCS FOTG Standard 585, Stripcropping, the crop sequence should be consistent with the stripcropping design.

Where excess plant nutrients or soil contaminants are a concern, utilizing deep-rooted crops or cover crops in the rotation can help recover or remove the nutrient or contaminant from the soil profile. Whole plant harvest as forage will further enhance nutrient uptake.

Where pesticides are used, consider application methods and the use of a crop rotation to avoid negative impacts on the following crop due to residual herbicides in the soil or adverse affects on aquatic wildlife or habitat through runoff.

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, as well as avoiding crops that require field operations when the soils are wet.

B. Additional Considerations to Reduce Sheet and Rill or Wind Erosion.

When used in combination with the residue and tillage management practices (Wisconsin NRCS FOTG Standards 329, 345, and 346), 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.

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.

C. 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.

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

D. Additional Considerations to Supply Plant Produced Nitrogen to Conserve Energy

Select crops that have the potential to provide larger amounts of biologically fixed nitrogen.

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

Select crop and management strategy to match nitrogen release from residues of nitrogen fixing crop with nitrogen uptake by subsequent crop, taking into account climate, soil physical and chemical properties, C:N ratio of residues of the nitrogen fixing crop, and timing of nitrogen demand by the subsequent crop.

E. 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 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 when and where pests are active.

Biological control of various crop pests can be provided by:

- crop rotations that include plant species that provide habitat for beneficial insects such as buckwheat or Phacelia;
- the use of plant species that produce chemical substances that control nematodes or other disease causing organisms (allelopathy)
- the use of insectory field borders, and
- intercropping of species that provide forage and nesting resources for beneficial insects.

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 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.

VI. Plans and Specifications

Plan documentation shall include:

- planned crop sequence by field or group of fields,
- list of forage species established as “hay” in the rotation, and
- documentation of rotation to address specific resource concerns such as balance of plant nutrients or to enhance soil organic matter content.

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 should include:

- sequence of crops to be grown,
- length of time each crop will be grown, and
- total length of rotation.

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

VII. 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 meet the criteria for all the resource concerns identified for the field or treatment unit.

VIII. References

USDA, NRCS Wisconsin Field Office Technical Guide, Section IV, Conservation Practice Standards and Specifications.

UWEX Publication A1525, Forage Variety Update for Wisconsin:

<http://learningstore.uwex.edu/pdf/A1525.PDF>

UWEX Publication A3397, Small Grain Varieties for Grain and Forage in Wisconsin:

<http://learningstore.uwex.edu/pdf/A3397.pdf>

UWEX Publication A3265, Selecting Corn Hybrids:

<http://learningstore.uwex.edu/pdf/A3265.pdf>

UWEX Publication A3646, Pest Management in Wisconsin Field Crops:

<http://learningstore.uwex.edu/pdf/A3646.PDF>

UWEX Publication A3615, Avoiding Herbicide Resistance in Weeds:

<http://ipcm.wisc.edu/Publications/tabid/54/Default.aspx>