NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
COVER CROP
(Ac.)
CODE 340

DEFINITION

Grasses, legumes, and forbs planted for seasonal vegetative cover.

PURPOSE

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

- Reduce erosion from wind and water.
- Maintain or increase soil health and organic matter content.
- Reduce water quality degradation by utilizing excessive soil nutrients.
- Suppress excessive weed pressures and break pest cycles.
- Improve soil moisture use efficiency.
- Minimize soil compaction.

CONDITIONS WHERE PRACTICE APPLIES

All lands requiring seasonal vegetative cover for natural resource protection or improvement.

CRITERIA

General Criteria Applicable to All Purposes

Plant species, seedbed preparation, seeding rates, seeding dates, seeding depths, fertility requirements, and planting methods will be consistent with applicable local criteria and soil/site conditions. Select appropriate species from Cover Crop Tables in Appendix 1. This is located in eFOTG Section IV – Conservation Practices – Cover Crop (340) folder. Locate the folder from the below link: http://efotg.sc.egov.usda.gov/treemenuFS.aspx

Select species that are compatible with other components of the cropping system.

Ensure herbicides used with crops in the rotation are compatible with cover crop selections and purpose(s). Some herbicides will carry over in the soil and restrict cover crop establishment, uses, and growth.

When a cover crop will be grazed, ensure that crop selection(s) complies with pesticide label rotational crop restrictions and that the planned management will not compromise the selected conservation purpose(s). To assist with this information please see "Herbicide Rotation Restrictions in Forage and Cover Cropping Systems". This is located in eFOTG Section IV – Conservation Practices – Cover Crop (340) folder. Locate the folder from the below link: http://efotg.sc.egov.usda.gov/treemenuFS.aspx

Cover crops may be established between successive production crops, or companion-planted or delayed planting into production crops. Select species and planting dates that will not compete with the production crop yield or harvest.

Cover crops may be established as single species monoculture or a mixture of two or more species. The type of cover crop shall be based on the desired purpose or purposes. Calculate the seeding rate of each species in a mixture based on the desired percentage of the single species rate shown in Appendix 1. Plant at a depth best suited to species selected in a diverse mixture for fast emergence.

Do not burn cover crop residue.

Cover crops will be terminated by frost, mowing, crimping, and/or herbicides in preparation for the following crop. Tilling of cover crops can be used, but is not encouraged due to the soil erosion susceptibility. Determine the method and timing of termination to meet the grower's objective, resource needs, and the current NRCS Cover Crop Termination Guidelines located in Section IV – Conservation Practices – Cover Crop (340) folder. Locate the folder from the below link: http://efotg.sc.egov.usda.gov/treemenuFS.aspx

The terminated cover crop must provide adequate surface protection to meet the desired purpose or purposes such as erosion control and water quality protection.

Cover crop(s) will not be harvested for grain, seed production, or hayed.

Treat the seed with the appropriate inoculum at the time of planting. See Missouri Agronomy Technical Note 36 titled "Legume Inoculation" in Section IV – Conservation Practices – Cover Crop (340) folder. Locate the folder from the below link: *http://efotg.sc.egov.usda.gov/treemenuFS.aspx*

Additional Criteria to Reduce Erosion from Wind and Water

Time the cover crop establishment in conjunction with other practices to adequately protect the soil during the critical erosion period(s) but prior to the final planting date set in Appendix 1 for the separate Missouri planting zones.

Select cover crops that will have the physical growth characteristics necessary to provide adequate erosion protection. Use Appendix 1 for planting zones and dates, winter hardiness, erosion protection, growth habit, and life span.

Use the current erosion prediction technology to determine the amount of surface and/or canopy cover needed from the cover crop to achieve the erosion objective.

To reduce erosion, best results are achieved when the combined canopy and surface residue cover attains 90 percent or greater during the period of potentially erosive wind or rainfall.

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

Cover crop species will be selected on the basis of producing higher volumes of organic material and root mass to maintain or increase soil organic matter. Use Appendix 1 to select species rated excellent to very good for organic matter builder.

The planned crop rotation including the cover crop and associated management activities will score a Soil Conditioning Index (SCI) value > 0, as determined using the current approved NRCS Soil Conditioning Index (SCI) procedure, with appropriate adjustments for additions to and or subtractions from plant biomass based on the anticipated cover crop growth and production.

The cover crop shall be planted as early as possible, but prior to the final planting date set in Appendix 1 for the separate Missouri planting zones. The cover crop will be terminated as late as practical for the producer's cropping system to maximize plant biomass production, considering crop insurance criteria, the time needed to prepare the field for planting the next crop, and soil moisture depletion.

Increase the diversity of cover crops (e.g., mixtures of several plant species) to promote a wider diversity of soil organisms.

Plant legumes or mixtures of legumes with grasses, brassicas, and/or other forbs to provide nitrogen through biological nitrogen fixation.

Legumes add the most plant-available N if terminated when about 30% of the crop is in bloom.

Before cover crops are grazed, the cover crops will need to have enough biomass produced to justify grazing and to maintain the soil health benefits. In most cases, the cover crop will need to have been established for at least 3 months. Most cover crops planted later in the fall would not be well enough established to graze in the winter, but if stands are adequate, cover crops can be grazed in the spring prior to termination. Cover crops should be a minimum of 6 – 8" in height before grazing begins. To insure adequate soil health benefits, livestock should graze no more than 40% of available cover crop forage.

Grazing will not take place during wet soil conditions. Severe damage could occur to the soil and stand of cover crops.

Different species have different tolerances to grazing. Grasses (cereal grains) are more tolerant than brassicas. There may be circumstances where monocultures of cereal grains could be lightly grazed during the winter.

Additional Criteria Reduce Water Quality Degradation by Utilizing Excessive Soil Nutrients

Establish cover crops as soon as practical prior to or after harvest of the production crop. (i.e. before or after harvest) but prior to the final planting date set in Appendix 1 for the separate Missouri planting zones.

Select cover crop species for their ability to effectively utilize or scavenge nutrients. See Appendix 1 for plant information.

Terminate the cover crop as late as practical to maximize plant biomass production and nutrient uptake. Practical considerations for termination date may include crop insurance criteria, the amount of time needed to prepare the field for planting the next crop, weather conditions, and cover crop effects on soil moisture and nutrient availability to the following crop. Refer to "Carbon to Nitrogen Ratios in Cropping Systems" in Section IV – Conservation Practices – Cover Crop (340) folder. Locate the folder from the below link: http://efotg.sc.egov.usda.gov/treemenuFS.aspx

If the cover crop will be grazed, choose species that are suitable for the planned livestock. Be aware of the pesticides used in the rotation and the effect on livestock consumption and harvest of livestock. To assist with this information please see "Herbicide Rotation Restrictions in Forage and Cover Cropping Systems". This is located in eFOTG Section IV – Conservation Practices – Cover Crop (340) folder. Locate the folder from the below link: http://efotg.sc.egov.usda.gov/treemenuFS.aspx

Additional Criteria to Suppress Excessive Weed Pressures and Break Pest Cycles

Select cover crop species for their life cycles, growth habits, and other biological, chemical and or physical characteristics to provide one or more of the following:

- Suppress weeds, or compete with weeds.
- Break pest life cycles or suppress plant pests or pathogens.
- Leave cover crop residues on the soil surface to maximize allelopathic (chemical) and mulching (physical) effects.
- Provide food or habitat for natural enemies of pests.
- Release compounds such as glucosinolates that suppress soil borne pathogens or pests.

Select cover crop species that do not harbor pests or diseases of subsequent crops in the rotation.

Seed a higher density cover crop stand to promote rapid canopy closure and greater weed suppression. Increased seeding rates (1.5 to 2 times normal) can improve weed-competitiveness.

Additional Criteria to Improve Soil Moisture Use Efficiency

In areas of limited soil moisture, terminate growth of the cover crop sufficiently early to conserve soil moisture for the subsequent crop. Cover crops established for moisture conservation shall be left on the soil surface.

In areas of potential excess soil moisture, allow the cover crop to grow as long as possible to maximize soil moisture removal.

Additional Criteria to Minimize Soil Compaction

Select and manage cover crop species that will produce deep roots and large amounts of surface or root biomass to penetrate or prevent compacted layers. Consider species that will increase soil organic matter and improve soil structure as additional benefits.

Use Appendix 1 to select species that "Break Compaction Layers" rated good to excellent.

CONSIDERATIONS

Beware of cover crop seeding dates in Missouri and possibility of Hessian Fly problems. Select resistant varieties for cover crops. Refer to MU Guide 7180 – "Hessian Fly Management on Wheat" written by Michael L. Boyd and Wayne C. Bailey Entomology Specialists. This is located in eFOTG Section IV – Conservation Practices – Cover Crop (340) folder. Locate the folder from the below link: http://efotg.sc.egov.usda.gov/treemenuFS.aspx

Plant cover crops in a timely matter and when there is adequate soil moisture and growing days to establish a good stand.

When applicable, ensure cover crops are managed and are compatible with the client's crop insurance criteria.

Maintain an actively growing cover crop as late as feasible to maximize plant growth, allowing time to prepare the field for the next crop and to optimize soil moisture.

Select cover crops that are compatible with the production system, well adapted to the region's climate and soils, and resistant to prevalent pests, weeds, and diseases. Avoid cover crop species that harbor or carry over potentially damaging diseases or insects in local crop production systems.

Cover crops may be used to improve site conditions for establishment of perennial species.

When cover crops are used for grazing, select species that will have desired forage traits, be palatable to livestock, compatible with pesticides/herbicides used in the rotation, and not interfere with the production of the subsequent crop.

Use plant species that enhance forage opportunities for pollinators by using diverse legumes and other flowering forbs. Refer to Appendix 1 Plant Information Tab for cover crops that are rated good to excellent for wildlife and pollinators. If wildlife habitat is a goal for use of cover crops, then it is recommended that cover crops be terminated before nesting season in Missouri which starts May 1st. This will help decreasing the probability of destroying nests. Planting width of commodity crops can also have an impact on wildlife. If considering protection of wildlife nests, then the desired planting width of 30 inches should be considered.

Cover crops may be selected to provide food or habitat for natural enemies of crop pests in local crop production systems.

Cover crops residues should be left on the soil surface to maximize allelopathic (chemical) and mulching (physical) effects.

Select a mixture of two or more cover crop species from different plant families to achieve one or more of the following: (1) species mix with different maturity dates, (2) attract beneficial insects, (3) attract pollinators, (4) increase soil biological diversity, (5) serve as a trap crop for insect pests, or (6) provide food and cover for wildlife habitat management.

Plant legumes or mixtures of legumes, grasses, and/or other forbs to achieve biological nitrogen fixation. Select cover crop species or mixture, and timing and method of termination that will maximize efficiency of nitrogen utilization by the following crop, considering soil type and conditions, season and weather conditions, cropping system, C:N ratio of the cover crop at termination, and anticipated nitrogen needs of the subsequent crop. Use University of Missouri - Columbia recommended nitrogen credits from the legume and reduce nitrogen applications to the subsequent crop accordingly. Treat the seed with the appropriate inoculum at the time of planting.

Time the termination of cover crops to meet nutrient release goals. Termination at early vegetative stages may cause a more rapid nutrient release compared to termination at a more mature stage.

Both residue decomposition rates and soil fertility can affect nutrient availability following termination of cover crops. Refer to "Carbon to Nitrogen Ratios in Cropping Systems" in Section IV – Conservation Practices – Cover Crop (340) folder. Locate the folder from the below link: http://efotg.sc.egov.usda.gov/treemenuFS.aspx

Allelopathic effects to the subsequent crop should be evaluated when selecting the appropriate cover crop.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for each field or treatment unit according to the planning criteria and operation and maintenance requirements of this standard. Specifications shall describe the requirements to apply the practice to achieve the intended purpose for the practice site. Plans for the establishment of cover crops shall, as a minimum, include the following specification components in an approved Cover Crop (340) Implementation Requirements document:

- Field number and acres
- Species of plant(s) to be established.
- Seeding rates.
- Seeding dates.
- Establishment procedure.
- Rates, timing, and forms of nutrient application (if needed).
- Dates and method to terminate the cover crop.
- Other information pertinent to establishing and managing the cover crop e.g., if haying or grazing is planned specify the planned management for haying or grazing.

Plans and specifications for the establishment and management of cover crops must be recorded in narrative form on the Cover Crop Design sheet JS-AGRON-340-CC located in Appendix 1 Section IV – Conservation Practices – Cover Crop (340) folder. Locate the folder from the below link: http://efotg.sc.egov.usda.gov/treemenuFS.aspx

OPERATION AND MAINTENANCE

Evaluate the cover crop to determine if the cover crop is meeting the planned purpose(s). If the cover crop is not meeting the purpose(s) adjust the management, change the species of cover crop, or choose a different technology.

Ensure that cover crops do not become invasive and that cover crops are compatible with planned crops/vegetation.

REFERENCES

A. Clark (ed.). 2007. Managing cover crops profitably. 3rd ed. Sustainable Agriculture Network Handbook Series; bk 9.

Hargrove, W.L., ed. Cover crops for clean water. SWCS, 1991.

Magdoff, F. and H. van Es. Cover Crops. 2000. p. 87-96 *In* Building soils for better crops. 2nd ed. Sustainable Agriculture Network Handbook Series; bk 4. National Agriculture Library. Beltsville, MD.

Reeves, D.W. 1994. Cover crops and erosion. p. 125-172 *In* J.L. Hatfield and B.A. Stewart (eds.) Crops Residue Management. CRC Press, Boca Raton, FL.

NRCS Cover Crop Termination Guidelines: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/climatechange/?cid=stelprdb1077238

Revised Universal Soil Loss Equation Version 2 (RUSLE2) website: http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/tools/rusle2/

Wind Erosion Prediction System (WEPS) website: http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/tools/weps/

USDA, Natural Resources Conservation Service, National Agronomy Manual, 4th Edition, Feb. 2011. Website: http://directives.sc.egov.usda.gov/ Under Manuals and Title 190.

NRCS Carbon to Nitrogen Ratios in Cropping Systems Jan. 2011. Website: http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/soils/health/mgnt/?cid=stelprdb1257753

University of Missouri Extension Publication G7180 Hessian Fly Management on Wheat January 2000. Website: http://extension.missouri.edu/publications

University of Wisconsin Extension Publication Herbicide Rotation Restrictions in Forage and Cover Cropping Systems June 2014. Website: http://wcws.cals.wisc.edu/documents

Missouri Agronomy Technical Note MO-36 Legume Inoculation August 2008. Website: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/mo/technical/?cid=nrcs144p2_012565