

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

COVER CROP

(Ac.)

CODE 340

DEFINITION

Crops including grasses, legumes, and forbs for seasonal cover and other conservation purposes.

PURPOSE

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

- Reduce erosion from wind and water.
- Increase soil organic matter content.
- Capture and recycle or redistribute nutrients in the soil profile.
- Promote biological nitrogen fixation.
- Increase biodiversity.
- Suppress weeds.
- Provide supplemental forage.
- Manage soil moisture.
- Reduce particulate emissions into the atmosphere.
- Minimize and reduce soil compaction.

CONDITIONS WHERE PRACTICE APPLIES

On all lands requiring vegetative cover for natural resource protection and/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 approved local criteria and site conditions. Select appropriate species from Tables 1 through 3.

Seed must be clean and relatively free of weed seed and other contaminants and comply with the Federal Seed Act and the Missouri State Seed Law. Do not plant seed that has become wet, moldy, or otherwise damaged.

Plant cover crop seeds at the proper depth for fast emergence. The proper depth is 1/8 to 1/4 inches deep for legumes and grasses and up to 1 and 1/2 inches deep for cereal grains. If the seed is applied by broadcast methods, roll or cultipack the area immediately after spreading the seed on a prepared seedbed. If the seed is broadcast into heavy residue or a growing crop, increase the seeding rate by 50 percent. Rolling or cultipacking will not be required.

Select species compatible with other components of the cropping system including nutrient and pest management.

Terminate cover crops by harvest, frost, mowing, tillage, crimper rolling, and/or herbicides in preparation for the following crop.

Herbicides used with cover crops will be compatible with the following crop in the rotation. Refer to Crop Replant and Rotation Guides in UMC Publication MP-575, "Weed Control Guide for Missouri Field Crops".

If tillage is used to terminate the cover crop, do not incorporate the cover crop residue more than two weeks prior to planting the next crop.

If the next crop is to be planted using no till planters or drills, control the cover crop with herbicide or crimper rollers to eliminate competition while maintaining the benefits of surface residue for runoff and erosion control.

Do not use plants that are on Missouri's noxious (invasive) weed list.

Cover crop residue will not be burned.

Summer Cover Crops

Select a seed mixture, seeding rate, and planting date from Table 1. Select species that provide desired benefits as a nurse crop, temporary cover, and/or green manure crop.

If the site is to be seeded to temporary cover to stabilize the soil resource for permanent vegetation establishment, the site preparation and seeding shall meet the requirements of the CRITICAL AREA PLANTING (342) practice standard.

Winter Cover Crops following Row Crop Production

If seeding the cover crop prior to the harvest of the primary crop, select an appropriate plant species and seeding rate from Table 2. Broadcast the seed by a method that allows for good coverage of the area and does minimal crop damage to the standing crop. Seeding dates are recommended from August 15 to September 15 or prior to leaf drop of the primary crop. No seedbed preparation is necessary.

If seeding the cover crop after harvest of the primary crop, select plant species, seeding rate, seeding date, and planting method from Table 2. Seed may be planted either no till or broadcast into existing residue cover.

Cover Crops for Orchards, Vineyards, and Nurseries

Apply fertilizer and lime according to a current soil test to meet the needs of the cover crop. Incorporate the soil amendments to a minimum depth of three inches while preparing a suitable seedbed.

Plant winter rye, winter triticale, winter wheat, winter barley, or annual ryegrass. Select an appropriate planting date from Table 2.

Additional Criteria to Reduce Erosion from Wind and Water

Time cover crop establishment, in conjunction with other practices, to protect the soil adequately during critical erosion periods for wind and water.

Select cover crops that will have the physical characteristics necessary to provide adequate protection to the site.

The amount of surface and/or canopy cover needed from the cover crop shall be determined using current erosion prediction technology.

Additional Criteria to Increase Soil Organic Matter Content

Select cover crop species on the basis of producing high volumes of organic material and/or root mass to maintain or improve soil organic matter.

Use the Soil Conditioning Index (SCI) procedure to determine the amount of biomass required to have a positive trend in the soil organic matter subfactor.

Terminate the cover crop as late as feasible to maximize plant biomass production, considering the time needed to prepare the field for planting the next crop and soil moisture depletion.

Additional Criteria to Capture and Recycle Excess Nutrients in the Soil Profile

Establish cover crops in time to have an actively growing ground cover before expected periods of nutrient leaching.

Select cover crop species for their ability to take up large amounts of nutrients from the rooting profile of the soil.

When used to redistribute nutrients from deeper in the profile up to the surface layer, terminate the cover crop early enough in relation to the planting date of the following crop in the rotation. If the objective is to best synchronize the use of cover crop as a green manure to cycle nutrients, factors such as the carbon/nitrogen ratios may be considered to kill early and have a faster mineralization of nutrients to match release of nutrient with uptake by following cash crop. A late kill may be used when the objectives are for biocontrol and maximizing the addition of organic matter. The right moment to kill the cover crop depends on the specific rotation, weather and producer's objectives.

Additional Criteria to Promote Biological Nitrogen Fixation

Establish only legumes or legume-grass mixtures as cover crops.

Inoculate the legume seed at the time of planting with the specific *Rhizobia* bacteria for that species. Select and apply the proper inoculant and amount recommended by the manufacturer for the species to be planted. The inoculant will be mixed with the seed and applied during the planting operation. Use a binder or sticking agent to help the inoculant adhere to the seed. Acceptable binders are commercially available or use a solution of water and corn syrup or sugar in a 10 to 1 ratio.

Additional Criteria to Increase Biodiversity

Select cover crop species that have different maturity dates, attract beneficial insects, increase soil biological diversity, serve as a trap crop for damaging insects, and/or provide food and cover for wildlife habitat management.

Additional Criteria to Suppress Weeds

Select species for the cover crop that will suppress or compete with weeds.

Maintain cover crop residues on the soil surface to maximize allelopathic (chemical) and mulching (physical) effects.

For long-term weed suppression, reseeding annuals and/or biennial species can be used.

Additional Criteria to Provide Supplemental Forage

Species selected will have desired forage traits, be palatable to livestock, and not interfere with the production of the subsequent crop.

Forage provided by the cover crop may be hayed or grazed as long as sufficient biomass is left for resource protection.

Additional Criteria to Manage 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 Reduce Particulate Emissions into the Atmosphere

Manage cover crops and their residues so that at least 80 percent ground cover is maintained during planting operations for the following crop.

Additional Criteria to Minimize and Reduce Soil Compaction

Select and manage cover crop species that will produce deep roots and large amounts of surface or root biomass to increase soil organic matter, improve soil structure and increase soil moisture through better infiltration.

CONSIDERATIONS

Plant the cover crop in a timely manner to establish a good stand.

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

Use deep-rooted species to maximize nutrient recovery.

Use grasses to utilize more soil nitrogen, and legumes to utilize both phosphorus and nitrogen.

Avoid cover crop species that harbor or carryover potentially damaging diseases or insects.

Avoid cover crop species that will become a weedy species in the current crop, herbicide, and tillage rotation.

Use cover crops to improve site conditions for establishment of perennial species.

Use plant species that enhance bio-fuels opportunities.

Use plant species that enhance forage opportunities for pollinators.

PLANS AND SPECIFICATIONS

Plans and specifications will be prepared for the practice site. Specifications for the establishment of cover crops shall include:

- Species or species of plants to be established.
- Seeding rates.
- Recommended seeding dates.
- Establishment procedure.
- Planned rates and timing of nutrient application.
- Planned dates for destroying cover crop.
- Other information pertinent to establishing and managing the cover crop.

Plans and specifications for the establishment and management of cover crops may be recorded in narrative form, on job sheets, or on other forms.

OPERATION AND MAINTENANCE

Control growth of the cover crop to reduce competition from volunteer plants and shading. Prevent the cover crop from producing viable

seed by mowing, harvesting for hay or silage, controlled grazing, or applying herbicides. Do not harvest below the stubble height needed for resource protection.

Control weeds in cover crops by mowing or by using other pest management techniques.

Control soil moisture depletion by selecting water efficient plant species and terminating the cover crop before excessive transpiration.

REFERENCES

Clark, A. (ed.), 2007. Managing Cover Crops Profitably. 3rd ed. Sustainable Agriculture Network Handbook Series; bk 9. National Agriculture Library. Beltsville, MD.

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.

Table 1: SUMMER COVER CROPS

PLANT SPECIES	SEEDING RATE <u>1/</u> (pounds per acre)	SEEDING DATES	
		Northern Missouri <u>2/</u>	Southern Missouri <u>2/</u>
Spring Oats	100	3/15 – 5/31	3/01 – 5/15
Sudangrass	20	4/15 – 6/15	4/01 – 5/31
Annual Ryegrass	9	3/15 – 6/15	3/01 – 5/31
Soybean (late maturity) <u>3/</u>	75	6/01 – 8/15	5/20 – 8/10
Red Clover and Spring Oats	3 50	3/15 – 5/31	3/01 – 5/15
Cover Crop Over-Seeded in Fall Planted Grain Crop:			
Red Clover	6	12/01 – 3/15	1/01 – 2/29

TABLE 2: WINTER COVER CROP

PLANT SPECIES	SEEDING RATE ^{1/} (pounds per acre)	SEEDING DATES	
		Northern Missouri ^{2/}	Southern Missouri ^{2/}
Cereal Grains:			
Winter Rye ^{4/}	75	8/01 – 10/15	8/15 – 10/31
Winter Triticale ^{4/}	120	8/01 – 10/15	8/15 – 10/31
Winter Wheat ^{4/}	90	8/01 – 10/15	8/15 – 10/31
Winter Barley ^{4/}	95	8/15 – 9/30	8/15 – 10/15
Spring Oats ^{5/}	100	8/01 – 9/10	8/10 – 9/20
Legumes:			
Hairy Vetch ^{6/}	40	8/15 – 9/15	8/15 – 9/30
Red Clover	6	8/15 – 9/15	8/15 – 9/30
Ladino Clover	3	8/15 – 9/15	8/15 – 9/30
Crimson Clover	6	8/15 – 9/15	8/15 – 9/30
Grasses:			
Annual Ryegrass	9	8/15 – 10/15	8/15 – 10/31
Mixtures:			
Hairy Vetch and Oats or Rye	15 60	8/15 – 9/15	8/15 – 9/30
Red Clover and Annual Ryegrass	2 6	8/15 – 9/15	8/15 – 9/30

TABLE 3: WIND EROSION CONTROL ON COTTON FIELDS BY PLANTING COVER CROPS IN THE FURROWS BETWEEN ESTABLISHED BEDS

PLANT SPECIES	SEEDING RATE ^{1/} (pounds per acre)	SEEDING DATES	
		Northern Missouri ^{2/}	Southern Missouri ^{2/}
Winter Wheat ^{4/}	30		8/15 – 10/31
Winter Rye ^{4/}	25		8/15 – 10/31

FOOTNOTES:

^{1/} Seeding rates shown are for seed placement with an adequate drill or planter. When using aerial seeding or other broadcast planting methods without rolling or cultipacking operations, increase the seeding rate per acre by 50 percent.

^{2/} Seeding dates are based on the county location within Missouri. Northern Missouri is all counties north of Bates, Henry, Benton, Morgan, Moniteau, Cole, Osage, Gasconade, Franklin, and St. Louis Counties. Southern Missouri is all counties including and south of those listed.

^{3/} Select late maturity soybean varieties to produce the highest biomass and nitrogen fixation. Inoculate soybean seed if soybeans are not in the normal crop rotation.

4/ Winter varieties of rye, triticale, wheat, and barley are easy to establish and generally economical but are very competitive. Fall plantings of these species may be used as a cover crop but not as a nurse crop or companion crop. Rye is the most tolerant to both wet and dry conditions and poor fertility; rye matures two to three weeks earlier than wheat. Barley is the most tolerant of salt conditions. **These cover crops must be killed in the spring with harvest operations, roller-crimpers, tillage, or herbicide applications.**

5/ Fall planted spring oats is an economical cover crop to establish, but the oats will winter kill and not survive into the spring. Plant oats early enough in the fall to get cover growth prior to the first killing freeze.

6/ Hairy Vetch is a vigorous winter annual that grows well on moist soils. It is best suited for southern Missouri. **CAUTION:** Hairy Vetch serves as a host plant for soybean cyst nematode and army worm.