



## Natural Resources Conservation Service

### CONSERVATION PRACTICE STANDARD

### COVER CROP

#### CODE 340

(ac)

#### DEFINITION

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

#### PURPOSE

This practice is applied to support general criteria and 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. (See Appendix – Table 1, Recommended Cover Crop Mixes or refer to SARE's publication:

[https://efotg.sc.egov.usda.gov/api/CPSFile/20802/340\\_TN\\_OTH\\_covercrop\\_tables\\_2019](https://efotg.sc.egov.usda.gov/api/CPSFile/20802/340_TN_OTH_covercrop_tables_2019)

<http://www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition.>)

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

Ensure herbicides used with crops are compatible with cover crop selections and purpose(s).

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

Do not burn cover crop residue.

Determine the method and timing of termination to meet the grower's objective and the current NRCS Cover Crop Termination Guidelines.

When a cover crop will be grazed or hayed, ensure that crop selection(s) comply with pesticide label rotational crop restrictions and that the planned management will not compromise the selected conservation purpose(s).

When grazing cover crops, the combined canopy and surface residue will be 90% or greater at all times. The cover crop should reach a minimum height of 10 inches before grazing and grazed no lower than 5 inches. An area must be provided to remove livestock from the cover crop when the cover crop is vulnerable to overgrazing or excessive trampling. The area must be a pasture or a designated sacrifice area away from sensitive areas. See the livestock feeding assessment tool in the TN Graze program to size and site the sacrifice area.

Cover crops will not be managed as a harvested crop.

If the specific rhizobium bacteria for the selected legume are not present in the soil, treat the seed with the appropriate inoculum at the time of planting.

#### **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).

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

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

Combined canopy and surface residue cover will be 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. Plant mixtures of legumes with grasses, crucifers, and/or other forbs. A minimum of 5 species will be planted with a total seeding rate of 100% or higher of the full rate. The full seeding rate in the mix should include (1) 10% or more of small grains and legume species components; (2) 5 to 15% brassica or crucifers (for cotton, no brassicas other than optional radish); and, (3) no more than 1.5 lbs. of brassicas are recommended in any mix. If planting after October 1, do not plant radish in the mix.

Species that will terminate by frost or heat (e.g. buckwheat) can make up to 20% of the total seeding rate for the mix.

Cover crops and the following cash crop will be planted no-till. EXCEPTION: Cash crops that have not been traditionally planted no-till (ONLY tobacco, green beans and vegetable crops) may be strip tilled at planting when meeting a STIR value of  $\leq 20$  for each crop in the rotation.

Target a C:N ratio prior to a high residue crop of 30:1 or less.

Target a C:N ratio prior to a low residue crop of 31:1 or higher.

C:N ratio effects nutrient cycling and soil residue cover. If the residue covering the soil is lacking, increase the C:N ratio by increasing the grass component and terminating the cover crop later. If residue is building up, lower C:N ratio by increasing the legume and or brassicas and terminate earlier.

Full width soil tillage is not permitted for any crop.

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.

The cover crop shall be planted as early as possible and 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.

#### **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)

Select cover crop species for their ability to effectively utilize nutrients.

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.

If the cover crop will be harvested for feed (hay/balage/etc.), choose species that are suitable for the planned livestock, and capable of removing the excess nutrients present. When a cover crop will be grazed or hayed, ensure that crop selection(s) comply with pesticide label rotational crop restrictions and that the planned management will not compromise the selected conservation purpose(s).

#### **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:

- To suppress weeds, or compete with weeds.
- Break pest life cycles or suppress of plant pests or pathogens.
- Provide food or habitat for natural enemies of pests.
- Release compounds such as glucosinolates (brassicas) that suppress soil borne pathogens or pests.

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

#### **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 cover crop species that have the ability to root deeply and the capacity to penetrate or prevent compacted layers. A mixture of fibrous roots (e.g. grass) and tap roots (e.g. radish, turnip, clover) improve soil structure.

### **CONSIDERATIONS**

Plant cover crops in a timely matter and when there is adequate moisture 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.

To improve fertility for the cover crop, phosphorus, potassium and lime can be applied to the cover crop for the following cash crop. Use Land Grant University's recommended nitrogen credits from the legume and reduce nitrogen applications to the subsequent crop accordingly. "Reduce N rate by 60 to 80 pounds per acre following a well-established single-species winter cover crop of crimson clover or hairy vetch that has reached early bloom stage." This will apply for all mixes that are 75% or more legume. For all others cover crop mixes, do not reduce N rate unless biomass is analyzed for N credit value.

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, 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 forbs.

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

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

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.

Cover crops may be selected that release biofumigation compounds that inhibit soil-borne plant pests and pathogens.

Species can be selected to serve as trap crops to divert pests from production crops.

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 with grasses, crucifers, 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 and residue cover for the subsequent crop.

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

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

Both residue decomposition rates and soil fertility can affect nutrient availability following termination of cover crops

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

For nursery production, grass cover crops may be used as opposed to legumes since grass cover crops do not build up as much damping-off fungi as legume crops.

Do not plant high biomass cover on soils that are somewhat poorly drained or wetter, unless planting can be delayed allowing the cover crop to wick out moisture. High biomass cover can be planted when soil temperatures are optimum and soils are not wet. Good slot closure is important.

Do not harvest cover crops for seed other than that needed to seed the following year's cover crop.

#### **CAUTION:**

Brassicas are not recommended in a cover crop mix prior to cotton because of the sensitivity of the cotton seedlings.

Austrian winter peas can cause issues when planting cotton. A mid-morning soil temperature of 68°F at proper planting depth for three consecutive days and a favorable five-day forecast following the planting of cotton are best.

Slugs can be an issue in soybean fields when climatic conditions are cool, overcast and wet. When heavy residue is present, delay planting until growing conditions are good. Soybeans will germinate at 55 °F but ideal soil temperature is 77 °F.

#### **Additional Considerations to Reduce Water Quality Degradation by Utilizing Excessive Soil Nutrients**

Use deep-rooted species to maximize nutrient recovery.

When appropriate for the crop production system, mowing certain grass cover crops (e.g., sorghum-sudangrass, pearl millet) prior to heading and allowing the cover crop to regrow can enhance rooting depth and density, thereby increasing their subsoiling and nutrient-recycling efficacy.

#### **Additional Considerations to Increase Soil Health and Organic Matter Content**

Aerial seeding is a no-till planting method. Consider aerial seeding only during moist conditions when rain is forecasted.

Consider leaving brassicas out of the cover crop mix every other year.

For optimum soil health benefits, land managers are strongly encouraged to only graze the cover crops just prior to termination.

Rotating species in the cover crop mix can improve diversity.

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

Plant legumes or mixtures of legumes with grasses, crucifers, 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.

Allow the cover crop to reach 10" height or provide a biomass of 3000 lb. (300 lb. /ac. In.) at termination.

#### **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.

## 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.

## 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.