



## 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 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.

Guidance for determining local criteria and evaluating soil/site conditions is presented in the Practice Guide for Cover Crops located in Section IV of the PA FOTG.

Select species 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).

Do not harvest cover crops for seed.

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 Revised Universal Soil Loss Equation Version 2 (RUSLE2) technology to determine the amount of surface and/or canopy cover needed from the cover crop to achieve the erosion objective.

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

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

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

Plant the cover crop as early as possible and terminate 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 before or after harvest of the production crop.

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 can 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.

For a cover crop to be harvested for feed (hay/balage/haylage/etc.), choose species appropriate for the planned livestock use and capable of removing the excess nutrients present.

#### **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 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 that suppress soil borne pathogens or pests.

Do not select cover crop species that may 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 capacity to penetrate or prevent compacted surface soils or the ability to root deeply and penetrate compacted subsurface soil layers.

## **CONSIDERATIONS**

To establish a good stand plant cover crops in a timely matter when moisture is adequate.

When applicable, ensure cover crops are managed in accordance with 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 suitable 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.

Cover crops may improve site conditions for perennial species establishment.

When cover crops are used for grazing, select species with desired forage traits, palatability to livestock, and do 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 cover crop at a higher density to promote rapid canopy closure and greater weed suppression. Increasing seeding rates 1.5 to 2 times the normal recommended rate can improve weed-competitiveness.

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

When cover crops are used 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.

To gain biological nitrogen fixation, plant legumes or mixtures of legumes with grasses, brassicas, and/or other forbs. Select cover crop species or mixture, and timing and method of termination that maximize efficient 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 Land Grant University-recommended nitrogen credit values for the

legume to reduce rate of nitrogen to the subsequent crop accordingly. If the specific rhizobium bacteria for the selected legume are not present in the soil, inoculate the legume seed with the appropriate inoculant at planting time.

Time the termination of cover crops to meet nutrient release goals. Termination at early vegetative stages may release nutrients more rapidly compared to termination at more mature stages.

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

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

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

#### **Additional Considerations to Reduce Erosion by Wind or Water**

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 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 allows the cover crop to regrow and increases root depth and density. This can increase its degree of subsoiling and nutrient- recycling efficacy.

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

Increase the diversity of cover crops (e.g., plant 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, 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.

### **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/Job Sheet 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 judge whether the cover crop meets 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

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

Magdoff, F. and H. van Es. Cover Crops. 2009. Building Soils for Better Crops. 3<sup>rd</sup> ed. Sustainable Agriculture Network Handbook Series; bk 10. Waldorf, 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.

USDA ARS, Cover Crop Chart (v.2.0 - March 2015) website: [www.mandan.ars.usda.gov](http://www.mandan.ars.usda.gov)

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

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

USDA NRCS, National Agronomy Manual, 4<sup>th</sup> Ed., Feb. 2011. Website: <http://directives.sc.egov.usda.gov/UnderManualsandTitle190>

USDA NRCS in Pennsylvania, Practice Guide for Cover Crop (340). FOTG.