

**USDA**  
**NATURAL RESOURCES**  
**CONSERVATION SERVICE**  
  
**DELAWARE CONSERVATION**  
**PRACTICE STANDARD**  
  
**COVER CROP**  
  
**CODE 340**

**DEFINITION**

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

**PURPOSES**

1. Reduce erosion from wind and water.
2. Increase soil organic matter content.
3. Capture and recycle or distribute nutrients in the soil profile.
4. Promote biological nitrogen fixation.
5. Increase biodiversity.
6. Weed suppression.
7. Provide supplemental forage.
8. Soil moisture management.

**CONDITIONS WHERE PRACTICE**  
**APPLIES**

On all lands requiring vegetative cover for natural resource protection and or improvement.

**CONSIDERATIONS**

Plant cover crop in a timely matter to establish a good stand.

The right time to kill the cover crop will depend on the specific rotation, weather, and objectives. Consider allowing time to prepare the field for

the next crop and avoiding excess moisture depletion by the cover crop. When faster mineralization of nutrients tied up in the cover crop's biomass is desired, consider destroying in the vegetative state when carbon/nitrogen ratios are lower. When weed suppression and increasing organic matter is a goal, consider killing the cover crop in the early reproductive stage, when carbon/nitrogen ratios are higher.

Use deep-rooted species to maximize nutrient recovery.

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

For most purposes for which cover crops are established, the combined canopy and surface cover is at nearly 90 percent or greater, and the above ground (dry weight) biomass production is at least 4,000 lbs/acre.

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

Use plant species that enhance biofuels opportunities.

Use plant species that enhance forage opportunities for pollinators.

**CRITERIA**

**Criteria Applicable to All Purposes**

Plant species, seedbed preparation, seedling rates, seeding dates, seeding depths, fertility requirements, and planting methods will be consistent with approved local criteria and site conditions.

Drilling or planting with a cultipacker-seeder or no-till drill are preferred seeding methods because they optimize seed-soil contact. Other methods may be used, such as broadcasting seed by hand, cyclone seeder, or aerial, but these methods usually result in poorer seed distribution and germination, and require higher seeding rates to compensate and provide good coverage. Plant cover crops as early as feasible within the time period indicated in Table 1.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

Apply lime and fertilizer only if needed based on recent soil test results. Any use of plant nutrients must be in compliance with Delaware nutrient management regulations, as applicable.

The species selected shall be compatible with other components of the cropping system.

Cover crops will be terminated by harvest, frost, mowing, tillage, crimping, and/or herbicides in preparation for the following crop.

Avoid using plants that are on the state's noxious weed or invasive species lists.

Cover crop residue will not be burned.

*Note: Specific cost-sharing programs or other funding sources may dictate criteria in addition to, or more restrictive than, those specified in this standard.*

#### **Additional Criteria to Reduce Erosion from Wind and Water**

Cover crop establishment, in conjunction with other practices, will be timed so that the soil will be adequately protected during the critical erosion period(s).

Plants selected for cover crops will have the physical characteristics necessary to provide adequate protection.

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

#### **Additional Criteria to Increase Soil Organic Matter Content**

Cover crop species will be selected on the basis of producing high volumes of organic material and or root mass to maintain or improve soil organic matter.

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

The cover crop will be terminated as late as feasible to maximize plant biomass production.

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

Cover crops will be established and actively growing before the expected period(s) of nutrient leaching. Cover crops need to be planted by October 30<sup>th</sup> in Kent and Sussex counties and by November 5<sup>th</sup> in New Castle County. No fall application of commercial fertilizers (N and P) or manure is allowed prior to planting the cover crop. No winter application of commercial fertilizer or manure is allowed. Spring application of manure can resume after March 1<sup>st</sup> in Sussex County and March 15<sup>th</sup> in Kent and New Castle Counties. Cover crops cannot be destroyed until after March 15<sup>th</sup>.

Cover crop species will be selected for their ability to take up large amounts of nutrients from the rooting profile of the soil.

#### **Additional Criteria to Promote Biological Nitrogen Fixation.**

Only legumes or legume-grass mixtures will be established as cover crops.

The specific Rhizobium bacteria for the selected legume will either be present in the soil or the seed will be inoculated at the time of planting.

#### **Additional Criteria to Increase Biodiversity**

Cover crop species shall be selected 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 for Weed Suppression**

Species for the cover crop will be selected for their chemical or physical characteristics to suppress or compete with weeds.

Cover crops residues will be left on the soil surface to maximize alleopathic (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 for Soil Moisture Management**

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.

**PLANS AND SPECIFICATIONS**

Plans and specifications for this practice shall be prepared in accordance with the previously listed criteria. Plans and specifications shall contain sufficient detail to ensure successful implementation of this practice. Documentation shall be in accordance with the section "Supporting Data and Documentation" in this standard.

**OPERATION AND MAINTENANCE**

The producer/client is responsible for the operation and maintenance of the practice. Operation and maintenance activities address the following:

1. Describe the extent of management needed to maintain the cover crop for the desired period of time. Management may consist of mowing, haying, grazing, harvesting grain, and/or surface residue.
2. Describe the acceptable uses, including grazing, haying, and time of year/frequency of use restrictions.

3. When the cover crop will be used for forage or hay, harvest when optimal nutritional content and yield is available.

**Record Keeping**

Participating producer must maintain records to allow the certifying individual to document plan implementation. As applicable, records include:

1. Species or species of plants planted.
2. Seeding rates.
3. Seeding dates.
4. Establishment method (i.e. aerial, no-till drill)

**SUPPORTING DATA AND DOCUMENTATION**

The following is a list of the minimum data and documentation to be recorded in the case file:

1. Location of the practice on the conservation map.
2. Assistance notes. The notes shall include dates of site visits, name or initials of the person who made the visit, specifics as to alternatives discussed, decisions made, and by whom.
3. Completed copy of the appropriate job sheet (s) or other specifications and management plans. Specify the following for each field or groups of fields:
  - a. Purpose of the planting.
  - b. Soil loss calculation when erosion is a purpose.
  - c. Plant species, varieties, method and rate of planting, and planting dates: Refer to Table 1.
  - d. Kill/destroy methods and dates.
  - e. Other management requirements, as appropriate.

## **REFERENCES**

1. Bowman, G., C. Cramer, and C. Shirley. A. Clark (ed.). 1998. Managing Cover Crops Profitably. 2<sup>nd</sup> ed. Sustainable Agriculture Network Handbook Series: Bk 3. National Agriculture Library. Beltsville, MD.
2. Hargrove, W.L., ed. Cover Crops for Clean Water. SWCS, 1991.
3. Magdoff, F. and H. Van Es. Cover Crops. 2000. p. 87-96 In Building Soils for Better Crops. 2<sup>nd</sup> ed. Sustainable Agriculture Network Handbook Series: bk4. National Agriculture Library. Beltsville, MD.
4. 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.

Species	Seeding Rate (lbs/ac) <sup>1/</sup>	Seeding Depth (inches) <sup>2/</sup>	Suitable Uses <sup>3/</sup>							Planting dates based on PHZ		Kill /Suppression Dates	
			E	O	R	N	B	F	W	6b	7a-b		
<b>WINTER ANNUAL GRASSES</b>													
Annual Ryegrass <i>Lolium perenne</i> spp. <i>multiflorum</i>	20 (15-50)	0.25 - 0.5	●	●	●				●	●	9/1 – 10/1	9/1 – 10/20	No later than May 1 for moisture conservation.
Spring Oats <i>Avena sativa</i>	95 (60-125)	1.0 - 1.5	●	●	●				●	●	9/1 – 10/1	8/1 – 9/15	No later than May 1 for moisture conservation. Spring oats may winter kill.
Winter Barley <i>Hordeum vulgare</i>	120 (90-150)	1.0 - 1.5	●	●	●				●	●	9/1 – 10/1	9/1 – 10/15	No later than April 15 for moisture conservation.
Winter Rye <i>Secale cereale</i>	120 (90-150)	1.0 - 1.5	●	●	●				●	●	9/1 – 10/1	9/1 – 10/20	
Winter Wheat <i>Triticum aestivum</i>	120 (90-150)	1.0 - 1.5	●	●	●				●	●	9/1 – 10/1	9/1 – 10/15	
Triticale	105 (90-120)	1.0 – 1.5	●	●	●				●	●	9/1 – 10/1	9/1 – 10/1	No later than April 15 for moisture conservation.
<b>WINTER ANNUAL LEGUMES</b>													
Austrian Winter Pea <i>Pisum sativum</i>	80 (60-100)	1.0 - 1.5	●			●					8/20 - 10/1	9/1 – 10/15	No later than 1 to 2 weeks before planting the next crop.
Bigflower Vetch <i>Vicia grandiflora</i>	35 (25-40)	0.5 - 1.0	●			●					8/20 - 10/1	9/1 – 10/15	
Common Vetch <i>Vicia sativa</i>	60 (25-90)	0.5 - 1.0	●			●					8/20 - 10/1	9/1 – 10/15	
Hairy Vetch <i>Vicia villosa</i>	20 (15-25)	0.5 - 1.0	●			●					8/20 - 10/1	9/1 – 10/15	
Crimson Clover <i>Trifolium incarnatum</i>	15 (10-20)	0.25 - 0.5	●			●					8/20 - 10/1	9/1 – 10/15	
Subterranean Clover <i>Trifolium subterraneum</i>	20 (15-30)	0.25 - 0.5	●			●					8/20 - 10/1	9/1 – 10/15	

Species	Seeding Rate (lbs/ac) <sup>1/</sup>	Seeding Depth (inches) <sup>2/</sup>	Suitable Uses <sup>3/</sup>							Planting Dates by PHZ		Kill/Suppression Dates <sup>5/</sup>
			E	O	R	N	B	F	W	6b	7	
<b>WINTER ANNUAL LEGUME/GRASS MIXTURES</b>												
Hairy Vetch <b>AND ADD:</b> Rye, Wheat, or Barley	18 (15-20) 45 (40-50)	1.0 1.0	●			●	●	●	●	8/20 - 10/1	9/1 - 10/15	No earlier than May 1 if nitrogen fixation is a goal.
Austrian Winter Pea <b>AND ADD:</b> Rye, Wheat, or Barley	60 (50-60) 45 (40-50)	1.0 - 1.5 1.0 - 1.5	●			●	●	●	●	8/20 - 10/1	9/1 - 10/15	
Crimson Clover <b>AND ADD:</b> Rye, Wheat, or Barley	15 (13-20) 45 (40-50)	0.5 0.5	●			●	●	●	●	8/20 - 10/1	9/1 - 10/15	
Crimson Clover <b>AND ADD:</b>	15 (13-20)	0.5	●			●	●	●	●	8/20 - 10/1	9/1 - 10/15	
Triticale	75 (60-90)	0.5	●	●	●		●	●	●			
<b>SUMMER ANNUALS</b>												
Sudangrass <i>Sorghum bicolor</i>	30 (20-40)	0.5 - 1.0	●	●	●			●	●	5/15 - 7/1	5/1 - 6/20	
Sorgham X Sudangrass Hybrids <i>Sorghum bicolor</i>	25 (20-30)	0.5 - 1.0	●	●	●			●	●	5/15 - 7/1	5/1 - 6/20	
Pearl Millet <i>Pennisetum glaucium</i>	20 (15-20)	0.5 - 1.0	●	●	●			●	●	6/1 - 7/15	5/15 - 7/1	
Foxtail (German) Millet <i>Setaria italica</i>	25 (20-30)	0.5 - 1.0	●	●	●			●	●	6/1 - 7/15	5/15 - 7/1	
Teff <i>Eragrostis tef</i>	5 (4-6)	0.125- 0.25	●	●	●			●	●			

WINTER ANNUAL BRASSICAS												
Kale Brassica oleracea	8 (5-12)	0.25 – 0.5	●		●			●	●	8/1 – 9/15	8/1 – 9/15	May be used for grazing animals. Kill prior to seed heads maturing.
Winter Rape (or Canola)	8 (5-12)	0.25 – 0.5	●		●			●	●	8/1 – 9/15	8/1 – 9/15	May be used for grazing animals Kill prior to seed heads maturing.

**NOTES FOR TABLE 1:**

- Seeding Rate:** The primary seeding rate should be used if broadcast seeding and cultipacking with average seedbed conditions. A seeding range is also given, in parentheses. When an optimum seedbed can be prepared or when a drill is used, use the rate at the low end of the range. When broadcast seeding without cultipacking, planting later than the ideal period, or planting in a rough seedbed, use the rate at the high end of the range. If aerial seeding, increase the seeding rate by 50%.
- Seeding Depth:** Provides the recommended depth to plant seed to obtain the best germination. Plant deeper in sandy soil, and less deep on clayey soil.
- Suitable Uses:** Lists the benefits obtained from each species or mix:  
E - Erosion control, wind and water  
O – Organic matter added  
R – Recycle excess nutrients  
N – Nitrogen Fixation  
B - Biodiversity  
F – Forage  
W -Weed suppression.
- Planting Dates:** Preferred planting dates are listed based on the Plant Hardiness Zones.
- Kill/Suppression Dates:** The preferred timing for killing the cover crop or suppressing growth of the crop. Harvesting or herbicide treatment may be used, or the crop may be plowed under, depending on the purpose and desired use of the cover crop.
- "Brassica" cover crops** (family *Brassicaceae*) include rape, kale, mustard, turnips, etc. Canola is a term for rape cultivars that are used to produce oil and other products for human and livestock consumption. All rape varieties are suitable for use as cover crops.

Brassicas can be especially useful for planting after early vegetable crops. Brassica cover crops are well-suited for uptake of residual nitrogen in the fall because they grow rapidly during periods of cool weather. They may also provide other benefits such as suppression of detrimental nematodes, plant diseases, and weeds.

There are a few drawbacks to using Brassica cover crops: (1) Brassicas have low tolerance for poorly drained or frequently flooded soils; (2) Plants are susceptible to below freezing temperatures, and may winter-kill. It is important that they be well-established (6 to 8 leaf stage) before a hard freeze in order to provide the benefits of a cover crop; (3) If allowed to set seed, these plants may become "weedy" in crop fields.