

**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

- 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.
- Weed suppression.
- Provide supplemental forage.
- Soil moisture management.
- 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, seeding rates, seeding dates, seeding depths will be established according to Table 1.

Seed planted with broadcast methods after primary crop harvest shall be harrowed or

cultipacked to achieve adequate seed soil contact.

Cover crop seed broadcast prior to the harvest of the primary crop shall limit the damage to the standing crop. Cover crops seeded into soybeans should be timed to coincide with leaf drop of the soybeans.

The species selected will 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.

Herbicides used with cover crops will be compatible with 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.

Select species and seed rates from Table 1.

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). Use only no-till planting methods for establishing cover crops after mid-October.

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

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

Cover crop species will be selected and fertilized where necessary to produce high quantities of shoot and 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, 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

Cover crops will be established and actively growing before the expected period(s) of nutrient leaching.

Cover crop species will be selected 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, the cover crop will be killed in relation to the planting date of the following crop. 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 if the objectives are to use as a biocontrol and maximize the addition of organic matter. The right moment to kill the cover crop will depend on the specific rotation, weather and objectives.

To maximize uptake of excess plant nutrients, e.g. nitrates, suitable cover crops should follow each crop in the crop rotation.

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.

Nitrogen from legume cover crops will be estimated and accounted for in the nutrient budget.

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 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. Select species and seed rates from Table 1 or Pasture and Hay Planting (Practice Code 512).

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.

Additional Criteria to Reduce Particulate Emissions into the Atmosphere

Manage cover crops and their residues so that at least 80% 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, allowing time to prepare the field for the next crop and moisture depletion.

Use deep-rooted species to maximize nutrient recovery.

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

Avoid cover crop species that harbor or carryover potentially damaging diseases or insects. Brassica cover crops should not be planted more than two years in a row due to potential increase in club root disease and cabbage root maggots.

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 bio-fuels opportunities.

Use plant species that enhance forage opportunities for pollinators.

Consider cover crops ahead of late planted crops such as sweet corn, snap beans,

cabbage, cucumbers, pumpkins, tomatoes, and late potatoes.

PLANS AND SPECIFICATIONS

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

- Species to be established.
- Seeding rates.
- 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 shall be on Job Sheet 340.

OPERATION AND MAINTENANCE

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

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

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Reeves, D.W. 1994. Cover crops and erosion.
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<http://www.ryegrasscovercrop.com/Home/tabid/87/Default.aspx>

Table 1.Common Cover Crops

Species	Seeding rate (Lbs PLS./ac)		Seeding Dates E=Early, M=Mid, L=Late, Spr=Spring, Sum=Summer, F=Fall, W=Winter	Seeding Depth (inches)	Total Nitrogen (Lbs./ac)	Dry matter yield (Lbs./ac)	Residual Nitrogen Recovery	Remarks
	Drilled	Broadcast						
Wheat	60-120	60-150	LSum-MF	1/2-1 1/2		3000-7000	Very Good	Easily established.
Rye	56-112	112-168	LSum-MF	1/2-1 1/2		3000-10000	Excellent	Easily established. Rapid growth in fall and spring. Allelopathic properties
Oats	64-100	100-130	ESpr, LSum-EF	1/2-1 1/2		2000-10000	Very Good	Easily established. Winter kills.
Annual Ryegrass	12-20	15-25	Espr, LSum-MF	1/4-1/2		2000-9000	Very Good	Easily established
Buckwheat	35-60	60-100	Spr-LSum	1/2-1 1/2		2000-3000	Poor	Summer smother crop. Residue degrades rapidly
Oilseed radish	15-25	20-30	EF	1/2-3/4		4000-9000	Good	May suppress of some nematode species. Should not precede or follow cruciferous crops
Sorghum-Sudangrass	20	20-40	LSpr-LSum	1/2- 1 1/2		8000-10000	Excellent	Mowing when stalks are 3-4 feet high increases root mass significantly. Biomass is maximized by fertilizing with nitrogen at 75-100 lbs./ac
Hairy vetch	15-20	20-30	ESpr or EF	1/2-1 1/2	90-200	2300-5000	Fair	Commonly planted with cereal rye. 56 lbs. Rye plus 20 lbs. Hairy vetch
Berseem Clover	8-12	15-20	ESpr or EF	1/4-1/2	75-220	6000-10000	Very Good	Very versatile cover crop. Winter kills.
Red Clover	8-10	10-12	LSum or Espr	1/4-1/2	70-150	2000-5000	Very Good	Easily established
Cowpea	30-90	70-120	ESum	1-1 1/2	100-150	2500-4500	Fair	Tolerates heat and low fertility
White Clover	3-9	5-14	LW-LSpr or EF	1/4-1/2	80-200	2000-6000	Fair	Easily established
Crimson Clover	15-20	20-30	ESum or Lsum	1/4-1/2	70-130	3500-5500	Good	Easily established
Sweet Clover	6-10	10-20	ESpr-LSpr or EF	1/4-1.0	90-170	3,000-5000	Fair	Deeply penetrating taproot during second year of growth

Table 1. Cover Crop Mixtures

Species	Seeding rate (Lbs PLS./ac)		Seeding Dates E=Early, M=Mid, L=Late, Spr=Spring, Sum=Summer, F=Fall, W=Winter	Seeding Depth (inches)	Total Nitrogen ¹ (Lbs./ac) Shoot and root	Dry matter yield (Lbs./ac)	Residual Nitrogen Recovery	Remarks
	Drilled	Broadcast						
Rye and Hairy vetch	56 + 15	56 + 20	LSum-EF	½ -1 1 1/2	100	2300-5000	Good	
Oats and Oilseed radish	32 + 20	64 + 25	LSum-EF	3/4		2000-4000	Good	Winter kills
Sorghum- Sudangrass and Cowpea	20 + 60	20 + 90	LSpr-LSum	1- 1 1/2		5000-8000-	Good	Adapted to poor fertility