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 and enhance habitat for pollinators
- 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, seedbed preparation, seeding rates, seeding dates, seeding depths, fertility requirements, and planting methods will be consistent with approved local criteria and site conditions.

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

Based upon purpose, select plant species and site management from Tables 1 and 2 for cropland, and Table 3 for orchards, vineyards and nursery cover. For development sites, refer to Critical Area Planting standard.

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.

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 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, 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.

Additional Criteria to Increase Biodiversity or Enhance Habitat for Pollinators

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.

Cover crops utilized as pollinator enhancements shall be a minimum of one-half (0.5) acre in size.

Plant species selected for cover crops shall compliment available pollinator forage and/or adjacent crops in bloom period and color.

Plant species utilized for pollinator habitat enhancements shall have a bloom period to enhance, prolong or maintain a source of nectar and/or pollen for as long as feasible during the growing season. However it is critical to provide nectar and pollen resources outside the bloom period of the crop to maintain healthy populations of pollinators.

Species selected shall be planted during the appropriate time to ensure that the cover crop blooms during the desired period. Planners shall have an understanding of the principle crops grown and the corresponding bloom periods.

Application of pesticides shall be minimized or eliminated. Refer to WV conservation practice standard (595) Integrated Pest Management for more information.

Species selected shall conform to criteria outlined in the West Virginia Pollinator Handbook and listed in the Plant Tables or Table 1 below. Additional species may be suitable for pollinator enhancements. Contact the State staff biologist to determine if other species are suitable.

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 for Weed Suppression

Species for the cover crop will be selected for their chemical or physical characteristics to suppress or compete with weeds. ***See table below for species suitable for weed suppression.***

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.

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 cover crop in a timely matter 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.

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 by using diverse legumes and other forbs.

Use cover crops to break pest cycles.

Use cover crops to recycle nutrients in the soil.

Use a diverse mixture of 2 or more species to address multiple purposes.

Consider the effect of deer browse on cover crop species, especially crops like buckwheat, alfalfa and clover.

Consider using this practice alone or in combination with other practices to create a minimum pollinator enhancement of at least one-half acre.

PLANS AND SPECIFICATIONS

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

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

- Species of plants to be established.
- ***Purpose of cover crop***
- Seeding rates.
- Recommended seeding dates.
- Establishment procedure.
- Planned rates and timing of nutrient application.
- ***Bloom period(s) of principle crop(s) if utilized as a pollinator enhancement***
- Planned dates for destroying cover crop.
- Other information pertinent to establishing and managing the cover crop ***(i.e. SCI score, etc)***

OPERATION AND MAINTENANCE

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

Evaluate the cover crop to determine if the cover crop is meeting the planned purpose(s). If the planned purpose(s) are not being met adjust the management, change the species or choose a different technology.

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

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

Preston Sullivan; Overview of Cover Crops and Green Manures
Fundamentals of Sustainable Agriculture, NCAT Agriculture Specialist, Published 2003 NCAT IP024

**** Bold Italics indicates information added to the national standard by WV NRCS.***

Table 1. Beneficial Cover Crop Performance

Specie	Rates (per acre)	Seeding Dates	Erosion Control	N Fixation (lbs/ac)	N (lbs)	P_2O_5 (lbs)	Nutrient Removal		Forage
							Organic Matter	Weed Suppression	
Annual Ryegrass	30 lbs	August 15 – October 15	**X**		**X**	**X (-15/T)**	**X**	**X**	**X**
Birdsfoot Trefoil	10 lbs	April 15 – May 15	**X**	**X (+40)**		**X**	**X**	**X**	**X**
Bluegrass	40 lbs	March 15 – April 15 August 15 – September 15	**X**		**X**	**X**	**X**	**X**	**X**
Cereal Rye	2 bu	August 15 – October 15	**X**		**X**		**X**	**X**	**X**
Crimson Clover	20 lbs	March 15 – April 15 August 15 – September 15	**X**	**X (+100)**		**X (-15/T)**	**X**	**X**	**X**
Crownvetch	5-20 lbs	April 15 – May 15	**X**	**X (+50)**				**X**	**X**
Hairy Vetch	30 lbs	August 15 – October 15	**X**	**X (+100)**				**X**	**X**
Orchardgrass	40 lbs	March 15 – April 15 August 15 – September 15	**X**		**X**	**X**	**X**	**X**	**X**
Red Clover	15 lbs	March 15 – April 15 August 15 – September 15	**X**	**X (+100)**		**X (-15/T)**	**X**	**X**	**X**
Ryegrass	40 lbs	March 15 – April 15 August 15 – September 15	**X**		**X**	**X**	**X**	**X**	**X**
Smooth Bromegrass	40 lbs	March 15 – April 15 August 15 – September 15	**X**		**X**	**X**	**X**	**X**	**X**
Spring Oats	2 bu	August 15 – October 15	**X**		**X**		**X**	**X**	**X**
Timothy	40 lbs	March 15 – April 15 August 15 – September 15	**X**		**X**	**X**	**X**	**X**	**X**
Wheat	2 bu	August 15 – October 15	**X**		**X**		**X**	**X**	**X**
White Clover	12 lbs	March 15 – April 15 August 15 – September 15	**X**	**X (+100)**		**X (-15/T)**	**X**	**X**	**X**

An **X** indicates that this species is suitable for the listed purpose.

Table 2. Suitable Cover Crops for Pollinator Enhancements

Cover Crop	Bloom Period	Flower Color	Seeding Dates	Seeding Rate (per acre)
Borage	Early	Blue	March 15 thru April 15	15 lbs
Crimson Clover	Early	Red	March 15 thru April 15 August 15 thru Sept.15	40 lbs
Hairy vetch	Early	Purple	August 1 thru Sept.15	20 lbs *
Purple vetch	Mid	Purple	March 15 thru April 15 August 15 thru Sept.15	60 lbs
Mustards (*Brassica sp*.)	Mid	Yellow	March 15 thru April 15 August 1 thru October 15	15 - 20 lbs
Alfalfa	Mid	Blue	March 1 thru May 1 August 1 thru October 15	20 lbs
White clover	Mid	White	March 15 thru April 15 August 15 thru Sept.15	10 lbs
Yellow Sweet Clover	Mid - Late	Yellow	March 15 thru April 15 August 15 thru Sept.15	18
Sweet White Clover	Mid	White	March 15 thru April 15	15 lbs
Red clover	Mid	Red	March 15 thru April 15 August 15 thru Sept.15	10 lbs
Buckwheat	Early - Late	White	May 15 thru August 15	75 lbs
Phacelia	Early – Mid	Blue	March 15 thru August 15	12 lbs

** May add a nurse crop of 40 lbs of winter wheat*

Table 3. Cover Crop Mixtures Suitable for Nurseries, Orchards and Vineyards

Mixture	Rate (per ac)	Seeding Date
Annual Ryegrass	20lbs	August 15 thru October 15
Rye Hairy Vetch	1bu 20lbs	August 15 thru September 15
Rye	2bu	August 15 thru October 15
Bromegrass	20lbs	August 15 thru September 15
Orchardgrass Ladino Clover	8lbs 2lbs	March 15 thru April 15 August 15 thru September 15
Wheat	2bu	August 15 thru October 15
Bluegrass Timothy	8lbs 4lbs	March 15 thru April 15 August 15 thru September 15
Bluegrass Ladino Clover	8lbs 2lbs	March 15 thru April 15 August 15 thru September 15