Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

COVER CROP

CODE 340

(ac)

DEFINITION

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

PURPOSE

This practice is used to accomplish one or more of the following purposes–

- 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 and reduce energy use
- Increase biodiversity
- Suppress Weeds
- Manage soil moisture
- Minimize and reduce soil compaction.

CONDITIONS WHERE PRACTICE APPLIES

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 including all Federal, state and local laws, and site conditions.

The species selected will be compatible with other components of the cropping system, including the nutrient and pest management provisions of the conservation plan.

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

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

Ensure herbicides used with cover crops are compatible with the following crop.

Cover crop residue will not be burned.

Refer to the Data Table and Species Guide in the Cover Crop Design Worksheet (NE-CPA-7) for selecting an appropriate cover crop to meet the planned use, and detailed information for seeding rates and dates.

Additional Criteria to Reduce Erosion from Wind and Water

Time cover crop establishment in conjunction with other practices, 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.

Determine the amount of surface and/or canopy cover needed from the cover crop 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, type of cover crop, type of cropping system, tillage system and other management practices required to have a positive trend in the soil organic matter subfactor. Refer to other appropriate practice standards such as Residue Management No- Till/Strip Till (329) and Conservation Crop Rotation (328) for requirements of other practices.

The cover crop shall be planted plant as early as possible and be terminated as late as feasible 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.

Refer to the Data Table and Species Guide in the Cover Crop Design Worksheet (NE-CPA-7) for guidance on selecting the appropriate cover crop, planting dates and seeding rates.

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.

Select cover crop species for their ability to take up large amounts of nutrients from the rooting profile of the soil. Winter annual cover crops such as rye or wheat or other appropriate cover crops that have at least six weeks of potential growth and will produce adequate biomass before a killing frost will be utilized for this purpose after the harvest of spring planted crops. Refer to the Data Table and Species Guide in the Cover Crop Design Worksheet (NE-CPA-7) to determine the most appropriate cover crops to tie-up and recycle nutrients, seeding rates and seeding dates.

Cover crops will be terminated early enough to ensure that the nutrients are available at the proper time for the following crop.

If excess nutrients in the soil profile are more than the cover crop can tie-up, the cover crop will be harvested in order to remove the maximum amount of excess nutrients.

Additional Criteria to Promote Biological Nitrogen Fixation and Reduce Energy Use

Use legumes or legume-grass mixtures to establish 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.

Refer to the Data Table and Species Guide in the Cover Crop Design Worksheet (NE-CPA-7) for selecting appropriate legumes, seeding dates and rates.

Nitrogen credits from legume cover crops will be accounted for in the nutrient management plan.

Additional Criteria to Increase Biodiversity

Cover crop species shall be selected that have different maturity dates, attract beneficial insects, attract pollinators, increase soil biological diversity, serve as a trap crop for damaging insects, and/or provide food and cover for wildlife habitat management.

The cover crop species selected, or at least a portion of the cover crop mix, shall be a different crop type than the previous crop (i.e. cool season grass, warm season grass, cool season broadleaf, warm season broadleaf). Refer to the Data Table and Species Guide in the Cover Crop Design Worksheet (NE-CPA-7) for additional guidance on selecting the appropriate cover crop to maximize biological diversity.

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.

Higher seeding rates to provide additional cover will help control weeds to eliminate or reduce herbicide use.

Cover crops residues will be left on the soil surface to maximize allelopathic (chemical) and mulching (physical) effects. Cover crops with allelopathic effects are identified on Species Guide in the Cover Crop Design Worksheet (NE-CPA-7).

A late kill may be used if the objectives are to use the cover crop as a biocontrol.

Additional Criteria for Soil Moisture Management

When lack of soil moisture is a concern terminate growth of the cover crop sufficiently early to conserve soil moisture for the subsequent crop. Leaving cover crop residue on the soil surface following termination will enhance conservation of soil moisture by reducing evaporation and improving infiltration.

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 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 Refer to the Data Table and Species Guide in the Cover Crop Design Worksheet (NE-CPA-7) for selecting an appropriate cover crop to reduce soil compaction and for seeding rates and dates.

CONSIDERATIONS

Plant cover crops in a timely manner according to dates listed on the Data Table in the Cover Crop Design Worksheet (NE-CPA-7) to ensure a good stand. Cover crops can be aerially seeded prior to crop harvest when necessary.

When applicable, ensure cover crops are managed in a manner that is compatible with the client's crop insurance requirements.

The type of cover crop selected depends on the purpose, or purposes, for which it is being grown. Close seeded high biomass crops such as oats, rye, wheat, sorghum or sudangrass are ideal for protecting the soil surface, controlling soil erosion, and increasing soil organic matter content. This is especially important following crops that provide little residue cover such as soybeans or corn silage. A minimum of 6-8 inches of growth is required for erosion control but 12 inches or more is optimal. To maximize erosion control and biomass production, maintain an actively growing cover crop as long as feasible to maximize plant growth.

Deep-rooted annual cover crop species such as wheat, rye or forage sorghum capture and recycle nutrients that might otherwise be lost to leaching. Oilseed radishes and turnips are also good nutrient scavengers and will recycle nutrients more quickly than the grass type cover crops.

The timing of cover crop termination for nutrient cycling depends on the type of cover crop and the method of termination. Cover crops with a low carbon to nitrogen (C:N) ratio, such as legumes and other broadleaves, decompose and release nutrients more rapidly than cover crops with high C:N ratios, such as grass type cover crops, especially if the grass type cover crops are allowed to grow beyond boot stage.

Incorporating the cover crop with tillage generally speeds decomposition and nutrient release but if the decomposition occurs too rapidly the nutrients may be lost to leaching or the soil organisms may temporarily tie up nutrients in the soil resulting in early season nutrient deficiencies. Cover crops that are left on the surface generally decompose more slowly and release nutrients to the growing crop throughout the growing season. Avoid cover crop species that harbor or carryover potentially damaging diseases or insects.

Consider how a cover crop fits the current herbicide program including the potential impact of herbicide carryover on the cover crop and options for controlling the cover crop in the following crop should escapes occur.

Consider the impact of the cover crop on available soil water for the following crop. In determining the impact on available water, consider the water holding capacity of the soil, the amount of water used by the cover crop, and the potential rainfall after the cover crop is terminated.

Be aware of potential allelopathic effects. While allelopathic effects may be beneficial for weed control they may also inhibit establishment and growth of the following crop.

Summer annual cover crops may be used to improve site conditions for grass establishment. When planted for this purpose, plant the cover crop in July through mid- August to achieve 12-18 inches of growth prior to killing frost. If necessary, remove excess growth in time to allow for re-growth. For additional information refer to Herbaceous Vegetation Design Procedures (550DP).

Oats or other spring small grains may be planted as companion crops with cool season grasses or legumes in order to accelerate cover establishment but should not be planted at a rate that inhibits the establishment of the planned seeding.

Use plant species that enhance forage opportunities for pollinators. Flowering species such as legumes and brassicas are ideal for pollinators.

Use a diverse mixture of 2 or more species to address multiple purposes. Cover crop mixtures (sometimes referred to as cocktails) provide greater benefits and often perform better when compared to a single species. Mixtures increase biodiversity and can address multiple objectives such as reducing compaction, scavenging nutrients, and increasing soil organic matter. They can also attract beneficial insects and provide food and cover for wildlife. Select the cover crop species to be included in the mix based on the intended purpose. Selecting species of different types (i.e. grasses, brassicas, legumes and other broadleaf species) will maximize benefits.

Cover crops are an essential component of organic cropping systems to control erosion, capture and recycle nutrients, and control pests. Including cover crops can reduce the need for tillage and improve or maintain soil quality.

Cover crops are also a valuable component of no-till cropping systems. Incorporating cover crops into a no-till system can reduce the need for pesticides and will enhance soil quality by increasing biological diversity and building soil organic matter. Cover crops will have the greatest impact on crop production and soil health when combined with a continuous no-till system.

PLANS AND SPECIFICATIONS

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

- Field number and acres
- Purpose(s) of cover crop
- Species of plants to be established.
- Seeding rates.
- Recommended seeding dates.
- Establishment procedure including the seeding method and tillage system.
- Planned rates and timing of nutrient application.
- Planned dates and method to terminate the cover crop.
- Other information pertinent to establishing and managing the cover crop.

Plans and specifications for the establishment and management of cover crops may be recorded in narrative form, on the Cover Crop Design Worksheet (NE-CPA-7), or on other forms that include all of the required information listed above.

Fertilization

- The recommended rate of fertilizer for plants used should be based on soil test results and the Nutrient Management Standard (590).
- In cases where time is lacking to make a soil test, a general recommendation is 20 lbs of Nitrogen in Vegetative Zones I and II and 40 lbs Nitrogen in Vegetative Zones III and IV for small grain cover crops.
- When establishing legume cover crops, special consideration shall be given to pH and soil phosphorous levels. Recommendations on liming and phosphorus fertilizer application will be based on soil tests and the Nutrient Management Standard (590).

OPERATION AND MAINTENANCE

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

Ensure that cover crops do not become invasive and that cover crops are compatible with planned crops/vegetation.

Control weeds in cover crops by mowing, with herbicides, 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 occurs.

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.

Liebig, M.A., H.A. Johnson, D.W. Archer, J.R. Hendrickson, K.A. Nichols, M.R. Schmer, and D.L. Tanaka. 2013. Cover Crop Chart: An intuitive educational resource for extension professionals. Journal of Extension [Online], 51(3) Article 3TOT7. Available athttp://www.joe.org/joe/2013june/tt7.php

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.

Midwest Cover Crop Council. Midwest Cover Crops Field Guide.

NRCS Nebraska Conservation Planning Form, Cover Crop Design Worksheet, NE-CPA-7: NE-CPA-7 Cover Crop Design Worksheet (9/18/2013)

NRCS Nebraska Vegetative Zone Map:
http://efotg.nrcs.usda.gov/references/public/NE/NebraskaVegetativeZones.pdf

NRCS Nebraska Herbaceous Vegetation Design Procedures (550 DP)
http://efotg.nrcs.usda.gov/references/public/NE/NE550DP.pdf

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.