



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 used to accomplish 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 needing vegetative cover for natural resource protection and or improvement.

Addressing the resource concern LIVESTOCK PRODUCTION LIMITATION – Inadequate Feed and Forage, is not a purpose of this practice standard. Refer to Indiana (IN) Field Office Technical Guide (FOTG) Standard (512) Forage and Biomass Planting for annual planted forages, specifically those that are planned to be harvested for hay and/or forage. Reference IN FOTG Standard (328) Conservation Crop Rotation for winter crops grown for grain and seed.

CRITERIA

General Criteria Applicable to All Purposes

Use of this standard requires compliance with all applicable federal, state, and local laws and regulations.

Seedbed preparation, species selection, seeding mixes, seeding rates, dates, depths, fertility requirements, site adaptation and planting methods will be consistent with the requirements and/or Tables in the IN NRCS Cover Crop Seeding Tool and/or the Midwest Cover Crop Council Cover Crop Decision Tool.

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.

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

Ensure herbicides used with crops are compatible with cover crop selections and purpose(s).

NRCS reviews and periodically updates conservation practice standards. To obtain the current version of this standard, contact your Natural Resources Conservation Service State office or visit the Field Office Technical Guide online by going to the NRCS website at <https://www.nrcs.usda.gov/> and type FOTG in the search field.

USDA is an equal opportunity provider, employer, and lender.

Do not burn cover crop residue.

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), according to a grazing or haying plan.

Do not harvest cover crops for seed.

Cover crops may only be grazed in a manner that retains or enhances the desired benefit(s) for the intended purpose(s).

Cover crops will be terminated by 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.

Determine the method and timing of termination to meet the grower's objective and the current NRCS Cover Crop Termination Guidelines.

For all situations where a subsequent spring crop is to be planted, termination will be **planned**:

- After adequate growth has occurred to accomplish the intended benefit, and
- Prior to potential detriment to the subsequent crop, and
- Prior to risk for excessive soil moisture depletion.

Spring termination and grazing will also follow the additional criteria for the stated purpose and comply with other USDA policies where applicable.

All management of cover crops must be adaptive to seasonal climate variations and cropping conditions.

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.

Ensure that plants are not listed as noxious weeds or invasive species for Indiana.

Seed will be labeled according to Indiana Seed Law.

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 the current erosion prediction 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

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 planned crop rotation including the cover crop and associated management activities will provide an equal or increased Soil Conditioning Index (SCI) value that is > 0, as determined using the current approved NRCS Soil Conditioning Index (SCI) procedure, with appropriate adjustments for additions to and or subtractions from plant biomass.

The cover crop will be planted as early as possible and be terminated 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 to Reduce Water Quality Degradation by Utilizing Excessive Soil Nutrients

Establish cover crops as soon as practical prior to or after harvest of the production crop. (i.e. before or after harvest).

Select cover crop species for their ability to effectively utilize and retain nutrients. At least 50% of the planned cover crop biomass of the planting will be species that are winter hardy.

Terminate the cover crop as late as practical to maximize plant biomass production and nutrient uptake and retention. Practical considerations for termination date may 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.

If the cover crop will be harvested for feed (hay/balage/etc.), choose species that are suitable for the planned livestock, 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 weeds, 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.

Seed a higher density cover crop stand to promote rapid canopy closure and greater weed suppression.

Select cover crop species that do not harbor pests or diseases of subsequent crops in the rotation.

Additional Criteria to Improve Soil Moisture Use Efficiency

In areas with 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 will be left on the soil surface.

In areas with 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 and manage cover crop species that will produce deep roots and large amounts of surface or root biomass to penetrate or prevent compacted layers, increase soil organic matter, improve soil aggregate stability, and increase water infiltration.

Grazing will be limited to only times with ideal soil conditions.

CONSIDERATIONS

The considerations section contains information that is optional to the planner.

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

When applicable, ensure cover crops are managed and are compatible with the client's crop insurance and/or USDA Program criteria.

The prime planting window to maximize corn yields in much of Indiana opens about April 20 and closes about May 10. This "window" typically opens about one week later across the northern tier of Indiana counties (later warm up) and about one week earlier across the southern tier of Indiana counties (earlier warm up). Planting date is but one of many yield influencing factors.

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

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

Use and manage 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.

Seed a higher density cover crop stand to promote rapid canopy closure and greater weed suppression. Increased seeding rates (1.5 to 2 times normal) can improve weed- competitiveness.

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.

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

Plant legumes or mixtures of legumes with grasses, crucifers, and/or other forbs to achieve biological nitrogen fixation. Select cover crop species or mixture, and timing and method of termination that will maximize efficiency of 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 USDA or Land Grant University (LGU)- recommended nitrogen credits from the legume and reduce nitrogen applications to the subsequent crop accordingly.

Time the termination of cover crops to meet nutrient release goals. Termination at early vegetative stages may cause a more rapid release compared to termination at a more mature stage.

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

Legumes add the most plant-available N if terminated when the cover crop is in early bloom.

Species can be selected to serve as trap crops to divert pests from production crops.

Consider previous herbicide applications for potential carryover when selecting the species of the cover crop. Of the cover crops, rye is the most tolerant of triazine carryover, followed by wheat, then oats, and lastly legumes. Triazine carryover may increase after lime application or in high pH soils.

Spring oats, some brassicas and sudangrass will normally winter terminate. Early planting of these cover crops is necessary to achieve environmental benefits. This will also reduce the need for a termination operation.

Grasses, including the cereal grains, are more winter-hardy than legume crops and should be included for fall plantings.

Some cover crop species have potential allelopathic effects. These plants produce chemical substances that can inhibit the growth or establishment of following crops.

Grazing is a management tool that may be used to improve nutrient cycling particularly with cereal grains. Prescribed Grazing may also be used to manage residue amounts prior to planting the next crop.

Grass or grain crops such as spring oats, winter wheat, winter rye, winter triticale, sudangrass, and annual ryegrass provide excellent canopy and ground cover for erosion reduction and provide excellent wind disruption at the soil surface.

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 and allowing the cover crop to regrow can enhance rooting depth and density, thereby increasing their subsoiling and nutrient-recycling efficacy.

Additional Considerations to Increase Soil Health and Organic Matter Content

Increase the diversity of cover crops (e.g., 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, crucifers, and/or other forbs to provide nitrogen through biological nitrogen fixation.

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 will describe the requirements to apply the practice to achieve the intended purpose for the practice site.

Plans for the establishment of cover crops will include:

- Plan view or map
- Field number and acres
- Species or species of plants to be established.
- Seeding rates.
- Recommended seeding dates.
- Establishment procedure.
- 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 job sheets, or on other forms.

OPERATION AND MAINTENANCE

The cover crop should be managed and maintained as part of a conservation cropping system with practices such as: Continuous No-till/Strip-till, Mulch-Till, Nutrient Management, Integrated Pest Management, and/or Waste Utilization.

Control growth and seed formation 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.

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.

Regular scouting for pests and disease will be completed.

REFERENCES

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.

RUSLE 2 (Soil Conditioning Index)

Midwest Cover Crop Council -Cover Crop Decision Tool- **Cover Crop Selector for Indiana Counties**

Purdue University ID-433, Midwest Cover Crop Field Guide

A. Clark (ed.). 2007. Managing cover crops profitably. 3rd ed. Sustainable Agriculture Network Handbook Series; bk 9.

Purdue University- WS- 16, Weed Control Guide for Indiana and Ohio

Purdue University ID-179 Corn and Soybean Field Guide

USDA, NRCS. 2006. The PLANTS Database. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Indiana Seed Law (IC-15-5, IAC-360-1) <http://www.in.gov/legislative/iac/T03600/A00010.PDF>

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

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

Wind Erosion Prediction System (WEPS) website:
<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/tools/weps/>

USDA, Natural Resources Conservation Service, National Agronomy Manual, 4th Edition, Feb. 2011. Website: <http://directives.sc.egov.usda.gov/> Under Manuals and Title 190.