



## 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 applied to support 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 requiring seasonal 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, and planting methods see will be consistent with, Michigan State University Extension (MSUE) recommendations in Extension Bulletin E-2646, Michigan Field Crop Ecology and other published MSUE bulletins etc.

Select species that are compatible with other components of the cropping system.

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

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.

Use weed-free and disease-free seed and establish cover crops by one of the following methods: over-seeding, frost seeding, aerial seeding, broadcast seeding, air-flow broadcasting, drilling or manure slurry seeding that follow MSUE recommendations. Aerial seeding of cover crops shall follow the requirements of the NRCS Michigan Agronomy Technical Note 52, *Aerial Seeding of Cover Crops*.

Do not burn cover crop residue.

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

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).

Do not harvest cover crops for seed.

If the specific rhizobium bacteria for the selected legume are not present in the soil, treat the seed with appropriate inoculum at the time of planting.

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

Time cover crop establishment, in conjunction with other practices, to adequately protect the soil during the critical erosion period(s).

Select cover crops that have the physical characteristics necessary to provide adequate protection (see Table 1).

Use the latest Revised Universal Soil Loss Equation (RUSLE2) or Wind Erosion Prediction System (WEPS) models to determine the amount of surface and/or canopy cover needed from the cover crop to achieve the erosion objective. See Section I of the local NRCS Michigan FOTG for instructions on using these models.

Inter seed small grain cover crops in rows with row or vegetable crops to reduce wind erosion losses to the atmosphere and protect young seedlings from wind erosion saltation (abrasion) damage. For example this is a common practice on MI muck farms growing onions.

#### **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 score a Soil Conditioning Index (SCI) value > 0 found in RUSLE2 2.5.2.11 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 shall be planted as early as possible and 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.

#### **Additional Criteria 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 nutrients.

Terminate the cover crop as late as practical to maximize plant biomass production and nutrient uptake. 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 excessive nutrients present

Cover crops to capture nutrients have many benefits. See the NRCS MI Agronomy Technical Note 46, *Buckwheat a Phosphorus Pump*; Agronomy Tech Note 47, *Squeezing More Value from Manure with Cover Crops* and Agronomy Tech Note 50 *Oilseed Radish Cover Crop*.

#### **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 cycles or suppress plant pests and pathogens.
- Provide food and habitat for natural enemies of pests.
- Release compounds such as glucosinolates that suppress soil borne pathogens or pests.

Pacific Gold Oriental Mustard cover crop can reduce damage of herbivore nematodes in orchards and potatoes. See the NRCS MI Agronomy Technical Note 45 Cover Crops for Orchards and NRCS MI Agronomy Technical Note 53, Soil Quality Enhancement for Tree Fruit and Potato Production Using Compost and Pacific Gold Oriental Mustard Cover Crop.

To reduce sugar beet cyst nematode pressure, seed a fall seeding of oil seed radish after small grain. **Use only Defender, Adagio or Colonel Oilseed radish varieties for this purpose.**

For long-term weed suppression, including on sites to be planted to trees and /or shrubs, perennials and/or biennial species can be used.

Cover crops for forest tree/tree shrub establishment sites shall be one of the following: white clover, redtop, Virginia Wildrye, Canada Wildrye (on upland landscapes), or Riverbank Wildrye (on floodplain or other lowland sites). The three Wildrye species are native to Michigan and are preferred for forest restoration plantings.

Cover crops for tree/shrub establishment shall control weeds in the areas between trees; however, cover crops are not a substitute for proper weed control in the areas adjacent to the trees and shrubs. Maintain at least an 18" radius zone around each seedling that is vegetation free. See the NRCS MI Tree/Shrub Establishment (612) and Tree/Shrub Site Preparation practice (490) standards for more information.

#### **Additional Criteria to Improve Soil Moisture Use and Efficiency**

In areas of limited soil moisture, terminate growth of 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 Minimize Soil Compaction**

Select and manage cover crop species that have the ability to root deeply and the capacity to penetrate or prevent compacted layers.

There are many benefits to using cover crops as bio- till crops to reduce soil compaction before adopting a no till farming system. See the NRCS MI Agronomy Tech Note 48, *Using CoverCrops to Convert to No Till*, Agronomy Tech Note 50, *Oilseed Radish Cover Crop*, and Agronomy Tech Note 51, *Radishes: A New Cover Crop Option*.

### **CONSIDERATIONS**

Plant cover crops in a timely matter and when there is adequate moisture to establish a good stand.

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

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 to optimize soil moisture.

Select cover crops that are compatible with the production system, well adapted to the region's climate and soils, and resistant to prevalent pests, weeds, and diseases. Avoid cover crop species that harbor or carry over potentially damaging diseases or insects.

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

When cover crops are used for grazing, select species that will have desired forage traits, be palatable to livestock, and not interfere with the production of the subsequent crop.

Use 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.

Cover crop residues should be left on the soil surface to maximize allelopathic (chemical) and mulching (physical) effects.

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.

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

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

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.

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 MSUE recommended nitrogen credits from the legume and reduce nitrogen applications to the subsequent crop accordingly. "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.

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

Allelopathic effects to the subsequent crop should be evaluated when selecting the appropriate cover crop.

Legumes add the most plant-available N if terminated when about 30% of the crop is in bloom.

**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.

Legumes add the most plant-available N if terminated when about 30% of the crop is in bloom.

**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 shall describe the requirements to apply the practice to achieve the intended purpose for the practice site. Plans for the establishment of cover crops shall, as a minimum, include the following specification components in an approved Cover Crop, 340, Implementation Requirements based on Michigan Seeding Tables as of September 2015, Cover Crops 340, Tables 1 or 4 or the latest Michigan Cover Crop Seeding Calculator for cover crop mixtures of 2 or more.

- Field number and acres.
- Species of plant(s) to be established.
- Seeding rates.
- Seeding dates.
- Establishment procedure.
- Rates, timing, and forms of nutrient application (if needed).
- Dates and method to terminate the cover crop.
- Other information pertinent to establishing and managing the cover crop e.g., if haying or grazing is planned specify the planned management for haying or grazing.

**OPERATION AND MAINTENANCE**

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**

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NRCS Conservation Information Sheet, 1998. Conservation Buffers and Beneficial Insects, Mites, and Spiders.

NRCS Agronomy Tech Notes:

45 - Cover Crops for Orchards

46 - Buckwheat a Phosphorus Pump

47 - Squeezing More Value from Manure with Cover Crops 48- Using Cover Crops to Convert to No-till

48- Using Cover Crops to Convert to No-till

49 - Cover Crops on the Edge

50 - Oil Seed Radish Cover Crop

51 - Radishes- A New Cover Option

52- Aerial Seeding of Cover Crops

53 - Soil Quality Enhancement for Tree Fruit and Potato Production Using Compost & Pacific Gold Oriental Mustard Cover Crops

54 - Michigan Cover Crop Management

Rust S.R., H.D. Ritchie, O. B. Hesterman, and J.J. Kells, 1988. Annual Summer Forage Production in Michigan, Michigan State University-Extension Bulletin E-2126, 8 pp.

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[Web2.msue.msu.edu/bulletins/Bulletin/PDF/E-2897.pdf](http://Web2.msue.msu.edu/bulletins/Bulletin/PDF/E-2897.pdf)

[Web2.msue.msu.edu/bulletins/Bulletin/PDF/E-2896.pdf](http://Web2.msue.msu.edu/bulletins/Bulletin/PDF/E-2896.pdf)

<http://www.covercrops.msu.edu/pdffiles/extension> bulletin E-2907.pdf. (Verified March 31, 2010)

<http://www.sare.org/publications/covercrops.htm>. (Verified 24 March 2010)

<http://web2.msue.msu.edu/bulletins/Bulletin/pdf/E-2956.pdf>. (Verified March 31, 2010)

See the following Web site for a list of Aerial Applicators or National Agricultural Aviation Association (NAAA) to aerial seed cover crops:

<http://agaviation.org/>

*Attachment: NRCS Cover Crop Termination Guidelines - Non-Irrigated Cropland*