

**NATURAL RESOURCES CONSERVATION SERVICE
NEW JERSEY
CONSERVATION PRACTICE STANDARD**

COVER CROP

(acre)

CODE 340

DEFINITION

Grasses, legumes, forbs, or other herbaceous plants established for seasonal cover and other conservation purposes.

PURPOSES

- ◆ Reduce erosion from wind and water
- ◆ Sequester carbon in plant biomass and soils to increase soil organic matter
- ◆ Capture and recycle excess 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.

CRITERIA

General Criteria Applicable To All Purposes

Plant species, seedbed preparation, seeding rates, seeding dates, seeding depths, and planting methods will be consistent with approved local criteria and site conditions.

The recommended cover crops, approved seeding rates, and optimum time of planting and killing are listed in Table 1.

Winter annual grasses and legumes shall be sown just prior to or immediately after harvest of the primary crop.

Overseeding is an acceptable establishment method. Winter rye, annual ryegrass, hairy vetch and various clovers can be overseeded into row crops before harvesting. Overseeding allows the cover crop to get a head start and provides soil coverage when the primary crop is harvested. It also reduces goose damage to young seedlings.

The species selected will be compatible with the nutrient management and pest management provisions of the plan.

Cover crops will be terminated by frost, mowing, tillage, and/or herbicides in preparation for the following crop. One exception is that some perennial legumes, such as crownvetch and flatpea, can be

successfully managed as a permanent, living mulch on cropland. Best results are obtained if the seed is covered by drilling or cultivating lightly after broadcasting.

Herbicides used with cover crops will be compatible with the following crop.

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). Seeding cover crops as early as possible will result in satisfactory cover. For all seedings, plant the cover crop within the time period indicated on Table 1. This may be immediately after harvesting the previous crop, or in the case of a late harvest, it may require overseeding. For fall seedings, it is vital that the seeding be no later than the seeding period so that sufficient growth occurs before winter dormant season. For spring or summer seedings, it is vital that the seeding be no later than the seeding period so that sufficient growth occurs before the summer drought or dormant season. In areas of large goose populations, adequate control over grazing is crucial to adequate cover.

When later seedings are needed, select a cover crop that will germinate rapidly to help assure a successful stand. Annuals generally germinate more rapidly than perennials, and grasses generally germinate more rapidly than legumes. The most rapid germinating seed listed on Table 1 are annual ryegrass, spring oats, and rye.

To perform satisfactorily, cover crops must provide at least 70% soil surface coverage during the critical erosion or water runoff period.

For best results, seeds should be placed at a controlled depth with the soil firmed around the seed. This will give good seed to soil contact, necessary for providing sufficient moisture for seed germination and growth. Drilling seed provides the best seeding method and uniform soil coverage. See Table 1 for seeding methods.

For orchards, vineyards, and nurseries where permanent vegetative covers are intended to establish cover 1 to 2 years before planting the orchard or vineyard, and strip-kill the cover with herbicides or cultivation prior to planting.

The amount of surface and/or canopy cover needed from the cover crop shall be determined using current erosion prediction technology.

Additional Criteria to Promote Biological Nitrogen Fixation

The specific Rhizobia bacteria will be inoculated at the time of planting legumes.

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

Select a winter annual legume or legume/grass mixture as indicated on Table 1. Winter annual legumes can provide a nitrogen source for a succeeding summer crop.

To perform satisfactorily, cover crops must provide at least 80% soil surface coverage by the spring to provide uniform amounts of nitrogen. Uniform soil coverage is generally a function of method of seeding. See Table 1 for seeding rates and Critical Area Planting Standard, Code 342 for planting dates.

Additional Criteria to Capture and Recycle Excess Nutrients in the Soil Profile

Cover crops will be established as early as possible in the fall or after the crop has been removed. For all seedings, plant the cover crop within the same time period indicated on Table 1.

Annual and perennial grasses will be selected because of their ability to absorb large amounts of nutrients from the rooting profile of the soil. Use those grasses listed in Table 1.

The aboveground biomass will be removed from the field for maximum nutrient removal efficiency. If forage is desired, green chop or graze in the late boot to early head stages when the plant has optimal nutritional content.

Additional Criteria to Sequester Carbon in Plant Biomass, in the Soil, and to Increase Soil Organic Matter

Cover crop species will be selected on the basis of producing high volumes of organic material to maintain or improve soil organic matter.

The cover crop will be terminated as late as feasible to maximize plant biomass and still prepare the seedbed for the subsequent crop.

The Soil Conditioning Index (SCI) shall reflect a positive trend for the cropping system.

Additional Criteria to Increase Biodiversity

Cover crop species shall be selected that, have different maturity dates, attract beneficial insects, 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 competition 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, perennials and/or biennial species can be used ([Table 1](#)).

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. This is usually two weeks prior to planting the intended crop.

Cover crops established for moisture conservation shall be left on the soil surface until the subsequent crop is planted.

In areas of potential excess soil moisture, allow the cover crop to grow as long as possible to optimize 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. These covers should increase soil organic matter, improve soil structure, and increase deep soil moisture through better surface infiltration.

CONSIDERATIONS

The cover crop should be terminated as late as feasible to maximize plant growth and still prepare the seedbed for the subsequent crop.

Deep-rooted species provide maximum nutrient recovery.

Consider that grasses utilize more soil nitrogen, and legumes utilize both nitrogen and phosphorus.

Avoid cover crop species that attract potentially damaging insects.

Acceptable benefits, for most purposes, are usually accomplished when the plant density is at least 25 stems per foot, the combined canopy and surface cover is at least 60 percent, and the above ground (dry weight) biomass production is at least 2700 lb/acre.

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

PLANS AND SPECIFICATIONS

Plans and specifications will be prepared for the practice site. Specifications will include, but are not limited to, recommended species, seeding rates and dates, establishment methods, nutrients needed, and other establishment or management information. Specifications can be recorded in narrative format, on job sheets, or forms designed to provide specific requirements for the practice.

OPERATION AND MAINTENANCE

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

Control weeds in the cover crop by mowing or herbicide application.

REFERENCES

The Agronomy Guide. 1999-2000. Penn State University. University Park, PA. 251pp.

USDA-NRCS. NJ FOTG. Critical Area Planting Standard, Code 342.

Table 1. Characteristics of common cover crops

Species	Life Cycle ¹	Plant Hard. Zone	Seeding Rate ² (lb/A)	Seeding Date	N-fixation (lb/A)	2001 Avg. Cost (\$)	Advantages	Disadvantages
LEGUMES								
Hairy vetch (<i>Vicia villosa</i> Roth)	WA	All	20-40	Aug/early Sept	80-250	1.50/lb	Most cold tolerant and highest yielding of all winter annual legumes; above-average drought tolerance; adapted to wide range of soil types	Requires early fall establishment, and slow to establish; little winter cover possible; matures in late spring; high P and K requirement for maximum growth; can harbor pests; potential weed problem in winter grains
Crimson clover (<i>Trifolium incarnatum</i> L.)	WA/SA	All	9-40 (avg 18-20)	Aug	70-130	1.80/lb	Rapid growth; above-average shade tolerance; forage use (no bloat); good nematode resistance	Poor heat and drought tolerance; no-till planting in residue is difficult due to steminess
Red clover (<i>Trifolium pratense</i> L.)	SLP (2-3 yr)	All	7-18	Aug	100-110	0.60-1.90/lb	Thick, deep taproot; adapted to humid areas; tolerates wet soil conditions and shade; forage use only if mixed with grasses	Initial growth slow; high P and K requirements for maximum growth; seed can persist creating volunteer problems; pure stand forage causes bloat; vulnerable to some pathogens, insects

¹ A=annual; WA=winter annual; SA=summer annual; B=biennial; SLP=short-lived perennial; LLP=long-lived perennial;

² Higher rates may be necessary for broadcast seedlings

Species	Life Cycle ³	Plant Hard. Zone	Seeding Rate ⁴ (lb/A)	Seeding Date	N-fixation (lb/A)	2001 Avg. Cost (\$)	Advantages	Disadvantages
White clover (<i>Trifolium repens</i> L.)	LLP	All	6-14	Aug or spring	100-130	2.30/lb	Adapted to most temperate zones; good heat, flood, drought, shade tolerance; low-maintenance and tolerates high traffic; forage use with grasses (better yields)	As a living mulch, may become competitive with crop if not mowed or tilled under; no yield during hot-dry weather; good nutrient management necessary; susceptible to some diseases, insects
Field peas (<i>Pisum</i> spp.) (e.g., Austrian winter pea)	SA/WA	6b&7	70-220	Aug or spring	50-150	0.40/lb	Rapid growth in cool weather; versatile legume; interseed with cereal and brassica spp.; used as food or feed	Austrian winter pea will not overwinter north of MD; shallow root system; sensitive to heat and humidity; susceptible to diseases, insect pests
Crownvetch (<i>Coronilla varia</i> L.)	LLP	All	5-20	Spring or early summer	40 (suppressed)	8.00-11.50/lb	Deep rooted and long-lived; good tolerance to heat, drought, and cold; no known insect or disease problems; excellent erosion control; fixes own nitrogen; can be managed as living mulch	Slow germination and establishment; high degree of management necessary; competes with crop if not suppressed
Birdsfoot trefoil (<i>Lotus comiculatus</i> L.)	SLP	5b&6a	5-10	Spring or early summer	40	3.90/lb	Quick establishment; tolerates poorly drained soils and low pH; fixes own nitrogen; can be managed as living mulch	Competes with crop if not suppressed or killed; does not spread and fill in on its own

³ A=annual; WA=winter annual; SA=summer annual; B=biennial; SLP=short-lived perennial; LLP=long-lived perennial;

⁴ Higher rates may be necessary for broadcast seedlings

GRASSES (Cool-season)	Life Cycle ⁵	Plant Hard. Zone	Seeding Rate ⁶ (lb/A)	Seeding Date	Value for Nutrient Mgt.	2001 Avg. Cost (\$)	Advantages	Disadvantages
Barley (<i>Hordeum vulgare</i>)	WA	All	100	North of Rt. 1 ⁷ by 10/15; south by 11/1	Fair nutrient scavenger	6.00/bu	Will perform about the same as oats. Biomass easy to manage in spring	Early cold may prevent growth to sufficient cover; regrowth may occur
Cereal rye (<i>Secale cereale</i> L.)	WA	All	60-200	North of Rt. 1 by 10/15; south by 11/1	Excellent nutrient and moisture scavenger (esp. N)	8.00/bu	Most cold tolerant of commonly used cover crops, late seedlings possible, germinates and grows rapidly; tolerates poor soil conditions and drought; rapid growth may provide some weed control; various uses: cover crop to food source	Regrowth may occur if not completely controlled (mature rye difficult to manage); possible crop suppression due to allelopathy or nutrient tie-up by rye; pest problems: small grain insects, diseases
Oats (<i>Avena sativa</i>)	SA	5&6	100 (3bu)	Spring or: north of Rt. 1 by 10/1; south by 10/15	Good nutrient scavenger (less if fall seeded)	4.50-6.00/bu	Rapid growth in cool weather; ideal for quick fall cover or nurse crop with legumes; winter kills; various uses: cover crop to food source	High lodging potential; susceptible to diseases and insect pests; winter kills
Winter Wheat (<i>Triticum vulgare</i>)	WA	All	120	North of Rt. 1 by 10/15; south: 11/1	Fair nutrient scavenger	5.00/bu	Biomass easy to manage in spring	Hessian fly may be a problem

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⁶ Higher rates may be necessary for broadcast seedlings

⁷ Rt. 1 refers to U.S. Route 1, which generally divides New Jersey between the Piedmont and Coastal Plain.

GRASSES (Cool-season)	Life Cycle ⁸	Plant Hard. Zone	Seeding Rate ⁹ (lb/A)	Seeding date	Value for Nutrient Mgt.	2001 Avg. cost (\$)	Advantages	Disadvantages
Annual/perennial ryegrass (<i>Lolium</i> spp.) Tall/fine fescue (<i>Festuca</i> spp.) Bluegrass spp. (<i>Poa</i> spp.) Smooth Bromegrass (<i>Bromus inermis</i>) Orchardgrass (<i>Dactylis glomerata</i>) Timothy (<i>Phleum pratense</i>)	Spp. variatio n	All	15-50+	Spring or Sept-Oct.	Fair to excellent nutrient and moisture scavenger	1.10/lb	Tolerant to wide range of soil conditions (TF, SBG, PRG ¹⁰); rapid establishment (FIG, OG, Tim.); tolerate shade, low pH and fertility (FF, TF); drought and heat tolerant (TF, SBG); winter-hardy (KBG, SBG, FF); form Dense sod (KBG, SBG); most can be used as feed; adapted for orchard/ornamental uses (FF, TF, KBG, PRG)	Slow establishment (KBG, SBG, FF*); low heat tolerance (PRG, FF, Tim.); may winter kill (PRG, TF, OG); bunch-type growth (FF, TF, PRG, OG, Tim.); may harbor insects and disease; living mulch requires high management

⁸ A=annual; WA=winter annual; SA=summer annual; B=biennial; SLP=short-lived perennial; LLP=long-lived perennial;

⁹ Higher rates may be necessary for broadcast seedlings

¹⁰ Species name abbreviations.

OTHER CROPS	Life Cycle ¹¹	Plant Hard. Zone	Seeding Rate ¹² (lb/A)	Seeding date	Value for Nutrient Mgt.	2001 Avg. cost (\$)	Advantages	Disadvantages
Buckwheat (Fagopyrum esculentum Moench)	SA	5&6	35-134	Spring or Sept-Oct.	Fair-good nutrient scavenger (esp. P, Ca)	11.00-12.50/ bu	Grows on wide variety of soils (infertile, poorly tilled, low pH); rapid growth; quick smother crop and good soil conditioner; cool, moist climates; food and feed source	Limited growing season, frost sensitive; poor growth on heavy limestone soils; Occasional pests
Brassicas (Crucifera family) (e.g., rape, kale, turnip, radish)	A/B	6&7	5-12	Spring or Sept-Oct.	Good nutrient scavenger (esp. N, P, Ca)	Varies	Quick establishment in cool weather; withstands light frost (but winter kills); deep, thick root systems; drought tolerant; highly digestible forage crop and other uses; continuous growth even with shorter days; may help insect and weed management	Low tolerance to wet soils; potential bloat problems (mix with 25%° grass); long-term "weed" problem if allowed to set seed (spreads by seed); occasional pests; winter kills

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¹² Higher rates may be necessary for broadcast seedlings