Cover Crop

Conservation Practice Specification Guide MA-340

WINTER RYE HOTO COURTESY OF CORNELL UNIVERSITY N.E.O.N. PROGRAM

General Specifications

Plans and specifications for the establishment of cover crops or green manure crops shall be prepared for each site or management unit according to the Criteria and Considerations and Operations and Maintenance procedures described in this standard, and shall be recorded on specification sheets, job sheets, in narrative statements in the conservation plan, or other acceptable documentation, in coordination with any other existing or required conservation systems.

When this practice is used to specify the vegetative component of another practice (e.g., grassed waterway, filter strip, etc.), plans and specifications shall meet the requirements of both standards to achieve the intended purpose of the practice. The completed work shall be checked and documented to verify that the practice was completed according to the drawings and specifications of both standards.

Species Selection

Selection of single species or a combination of species depends on the local climate, intended use, and management resources of the farm. A combination of Winter Rye—Hairy Vetch is very effective as a soil cover and additional nitrogen source, however, this combination requires timely spring plow-down due to Winter rye's vigorous spring growth. Other combinations include Oats—Hairy Vetch, Oats—Red clover, Italian (Annual) Ryegrass—White clover, and Timothy—alfalfa.

Complex mixes or Cover Crop Cocktails might include annual ryegrass and clovers, timothy and alfalfa, and sorghum/millets with soybean or cowpea. It is advisable to trial unfamiliar combinations on a small-scale basis to determine if they are suited to the location. Consult the Cover Crop Periodic Table (listed in the references for more information).

When calculating a seeding rate for cover crop mixes, ensure that the sum of the proportional rates used exceeds 100%. For example, if the full seeding rate for oats is 140 lbs/ac and hairy vetch is 35 lbs/ac, the combination of 80 lbs/ac oats (80/140=57%) and 20 lbs vetch (20/35=57%) would be acceptable because the 57%+57%=114%. A combination of 80 lbs/ac oats (57%) and 10 lbs/ac vetch (28%) would not be acceptable because 57%+28%=85%.

Inoculants

All legume seed shall be inoculated with a pure culture of nitrogen-fixing bacteria prepared specifically for the species. For best results, consider selecting pre-inoculated, coated seed when available.

Green Manure Crops

Green manure crops are sown in early June and grown during the main season primarily to increase soil organic matter, suppress weeds, and to improve soil structure and tilth. Green manure crops such as Buckwheat should be mown or disked at or before flowering so that it does not become a weed problem.

Sorghum/Sudangrass (Sudax) is a vigorous warm season grass that will regrow during the growing season. When Sudax reaches a height of approximately 3 feet, it should be mown leaving a ~6" stubble. It will regrow from the highest viable node; Sudax is a heavy nitrogen feeder.

Seeding Dates

To produce maximum growth prior to frost, sow winter cover crops as soon as possible after crop harvest. Some cover crops can be sown at the same time or immediately following last cultivation of row crops. If pre-emergent herbicides were used on the main crop, the cover crop shall be compatible with the herbicide.

Seeding dates for cover crops for soil erosion prevention (which meets NRCS Resource Management System Quality Criteria) are presented in Table 2 on the following page.

Seeding rates for all cover crops and the optimum seeding dates for green manure crops are also presented in Table 2.

If the main goal is to scavenge/maximize nitrogen uptake following the main season crop, cover crops should be planted no later than the dates indicated in the table shown below. Follow the seeding rates presented in the table on the following page.

Seeding Dates for Small Grains for Maximum Nitrogen Recovery

Common Resource Area	Geographic Area	Latest Seeding Date
CRA 143	Berkshires	August 15
CRA 144A	Central and Eastern MA	September 1
CRA 144B	Berkshires Foothills and Worcester Hills (NW)	August 25
CRA 145	Connecticut River Valley	September 1
CRA 149	SE MA, Cape Cod, and Islands	September 15

Interseeding

Interseeding in this guide refers to the process of broadcasting a cover crop into a cash crop. Also known as undersowing or oversowing. Companion planting refers to the simultaneous planting of 2 or more crops. Large seeded crops, in particular, are planted or drilled along with another crop (*e.g.* corn and soybeans). Both crops tend to be harvested and have value, but one of the crops performs as a cover crop (*i.e.* soybeans provide N to corn)
Nurse crops refer to rapidly growing crops that assist with the establishment of a perennial crop or other crop that is slow to establish.

Mixes

Common mixes include a small grain (winter rye or oats) with a legume (hairy vetch, red clover or peas).

Grazing

A number of cover crops can be grazed prior to termination to improve the overall value of the cover crop. Check each cover crop to ensure that the crops pose no danger to livestock. A few examples are: (i)

Sorghum/Sudangrass may cause prussic acid and nitrate poisoning if the young growth is grazed or if the crop is grazed after frost, (ii) seed of Chickling vetch contains a neurotoxin that may cause illness, (iii) alsike clover may be toxic to horses and other livestock, (iv) turnips may cause copper toxicity in sheep, (v) red clover contains phytoestrogens that may complicate sheep breeding, and (vi) many of the legumes may cause bloat and should not be grazed when growth is lush and moisture content is high.

Living Mulches

Vegetable crop producers should consider using living mulches to prevent erosion, improve soil structure and microbial population, improve water relations, and provide beneficial insect habitat. Legume living mulches like berseem clover are well suited for New England and provide supplemental N if they are mown and blown to adjacent cash crop rows. Living mulches can be established before or after the cash crop is planted, and can be used alone or in combination with plastic mulch. Using a biodegradable black plastic mulch and seed the alley with a living mulch is a successful management practice that is becoming popular. Typically living mulches should be low growing and tolerate mowing. Mulches should be mowed if becoming overly competitive or if going to seed. Operation and Maintenance

The operator will inspect and calibrate equipment prior to use to insure proper rate, distribution and depth of planting material.

Growth of seedlings or sprigs shall be monitored for water stress. Depending on the severity of drought, water stress may require reducing weeds, early harvest of any companion crops, irrigating when possible, or replanting failed stands.

Invasion by undesirable plants shall be controlled by cutting, using a selective herbicide, or by grazing management by manipulating livestock type, stocking rates, density, and duration of stay.

Insects and diseases shall be controlled when an infestation threatens stand survival.

Evaluate forage stands each season or as needed to determine management inputs needed to achieve the desired purpose.

TERMINATION

For non-irrigated cover crops, the cover crop must be terminated at or before the periods specified in the “NRCS Cover Crop Termination Guidelines—Non-Irrigated Cropland”. See eFOTG Section IV Cover Crops for the termination guidelines.

REFERENCES

Building Soils for Better Crops. 3rd Ed. Magdoff, F. and H. van Es. Cover Crops. 2009. Sustainable Agriculture Network Handbook Series; Book 10. National Agriculture Library. Beltsville, MD.

Cover Crop Chart (Period Table). 2013. USDA-ARS Northern Great Plains Research Lab, Mandan, ND. http://www.ars.usda.gov/SP2UserFiles/Place/30640500/CCC/CCC_v13_5_2012.pdf

Managing Cover Crops Profitably, 3rd Ed Sustainable Agriculture Network. 2007.. Handbook Series, Book 9. Beltsville, MD: National Agricultural Library.

New England Vegetable Management Guide. 2014-2015. Howell, J.C.and R. Hazzard, editors.

Smith, Brandon. USDA NRCS NH Cover Crop Planting Specification Guide. 2013 http://efotg.sc.egov.usda.gov/references/public/NH/NH_340_CoverCrop_Planting_Specs_Dec_2013.pdf

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Table 2. Planting Dates & Seeding Rates (Drilled) for Soil Erosion Prevention
(If seed is broadcast and disked, increase the seeding rate by 20%)

Cover Crop Species	Seeding Rates		Latest Seeding Date by Common Resource Area (CRA)				
	Pounds / Acre	Bushels / Acre	CRA 143	CRA 144A	CRA 144B	CRA 145	CRA 149
Cereal Grains (Pure Stands)							
Barley	120	2	Sept 20	Sept 25	Sept 20	Oct 10	Oct 20
Winter Rye	110	2					
Winter Wheat	120	2					
Oats	100	2	Aug 15	Sept 1	Aug 25	Sept 15	Oct 1
Cereal Grains (Seeded with Legumes)							
Barley	40-50	1	Aug 15	Sept 1	Aug 25	Sept 1	Sept 1
Winter Rye	30-40	1					
Winter Wheat	30-40	1					
Oats	50-60	1	Aug 1	Aug 15	Aug 1	Aug 15	Aug 15
Legumes (Pure Stands and Seeded with Grains) *Seeding Dates for Pure Legume Stands*							
Alfalfa	15-25	¼	Aug 15	Sept 1	Aug 25	Sept 1	Sept 1
Field Pea	60-80	1					
Hairy Vetch	30-40	½					
Red Clover	10-15	¼					
White Clover	10-12	¼					
Grasses							
Annual Ryegrass	30-40	½	Aug 15	Sept 1	Aug 25	Sept 15	Oct 1
Smooth Bromegrass	15	½					
Orchardgrass	10	½					
Main Season Green Manure Crops							
Oats	100-150	2-3	June 15	June 1	June 15	May 15	May 1
Sudangrass and Sudax	30-40	1	June 30	June 15	June 15	June 15	June 15
Buckwheat	60-70	1-2	June 30	July 15	July 15	July 15	July 15
Early Season Green Manure Crops							
Oats & Peas (2:1)	100-150	2-3	April 15	April 1	April 15	April 1	April 1

Cover Crop Characteristics Compiled by Brandon Smith, USDA NRCS NH	Purpose									Other Roles & Characteristics										
	Reduce Erosion	Increase SOM	Recycle Nutrients	Fix Nitrogen Save Energy	Improve Biodiversity	Suppress Weeds	Remove Excess Soil Moisture	Loosen Topsoil	Reduce Subsoil Compaction	Grazing Potential	Living Mulch	Broadcast Interseed	Companion Crop	Nurse Crop	Reduce Soil Diseases	Rapid Growth	Drought Tolerant	Flooding Tolerant	Shade Tolerant	Reseeds (Potential Weed!)
Cool-Season Grains																				
Winter Rye (Common)	P+	P+	P+			P+	P+	P+		P-		P		P	P	P	P	P-	P	P
Winter Rye (*Aroostook*)	P+	P+	P+			P+	P+	P+		P-		P		P	P	P+	P	P-	P	P
Triticale and Spelt	P	P+	P			P	P+	P	P-	P				P+		P	P-			
Wheat	P	P+	P			P	P+	P	P-	P				P+		P	P-		P-	P-
Barley	P+	P+	P		P-	P	P	P	P-	P				P+	P-	P	P		P-	P
Oats	P-	P	P-			P+	P	P		P-	P-	P-	P+	P+	P-	P+		P-		
Warm-Season Grains																				
Buckwheat		P-	P+		P+	P+		P					P+	P		P+				P+
Sorghum/Sudangrass	P+	P+	P+		P-	P+	P-	P-	P+	P					P	P+	P+	P-	P-	P-
Japanese/Foxtail Millet	P	P+	P			P+		P		P+				P		P	P+			P-
Pearl Millet	P	P+	P			P+		P		P-						P	P+			P-
Teff	P+	P	P-			P-		P+		P+	P+	P-	P-	P			P+			
Legumes																				
Red Clover	P-	P	P	P	P+	P-	P	P-	P	P+		P+	P+					P-	P	
White or Alsike Clover	P	P		P	P	P	P	P		P+	P	P	P				P-	P	P	P+
Berseem Clover	P	P+	P+	P+	P-		P+	P		P+	P+	P	P	P		P+	P-	P-	P	
Sweetclover	P	P+	P+	P+	P+	P	P	P+	P+	P						P-	P+			P-
Crimson Clover	P	P		P	P+		P-	P-		P+		P+	P+			P-			P	P+
Subterranean Clover	P	P		P	P	P+	P+	P-		P	P+	P+	P+			P-	P	P-	P	P+
Alfalfa	P	P+		P+	P		P		P+	P+										
Hairy Vetch	P-	P+	P-	P+	P	P	P	P	P-	P-	P-	P	P		P-		P-		P-	P-
Chickling Vetch	P	P	P-	P+	P-	P	P	P		P+	P	P	P				P-		P-	P-
Field Pea	P	P		P+	P		P	P		P			P+	P	P	P	P-			
Soybean	P-	P		P+				P		P			P+				P			
Cowpea	P+	P	P-	P+	P	P+		P	P-	P-			P			P	P		P-	
Brassicas																				
Radish or Turnip	P	P	P+			P+		P-	P+	P-		P	P-			P			P-	P-
Mustard or Canola	P	P	P		P-	P-		P		P-		P	P-	P-	P+	P	P		P-	P+
Arugula	P	P-	P-					P				P			P+	P			P-	P-
Grasses																				
Annual Ryegrass	P+	P+	P+			P+	P+	P+		P+	P	P+	P+	P+	P-	P		P	P	P+
Perennial Ryegrass	P+	P+	P+			P	P+	P+		P+	P	P+	P	P	P-	P		P	P	P
Orchardgrass	P+	P+	P-			P	P+	P		P+		P				P		P	P-	P
Timothy	P+	P+	P-			P	P+	P		P		P-						P-		P

Rating: Above Average (P+); Average (P); Below Average/Unknown (P-). Blank = Not Recommended

Refer to text in accompanying Planting Specification Guide for more information about selecting selecting and managing each cover crop.

Table 2b - NH 340	Seeding Rate (lbs/acre)		Seeding Depth	Planting Season								Termination Method					
Cover Crop	**Broadcast**	**Drilled**	**Inches**	**Spring**	**Early Summer**	**Summer**	**Early Fall**	**Fall**	**Late Fall**	**Dormant**	**Frost**	**Mow**	**Till**	**Crimp**	**Frost**	**Winter**	**Chemical**
Cool-Season Grains																	
Winter Rye (Common)	150	110	1-2				**P**	**P+**		**P-**		**P**	**P**	**P+**			**P**
Winter Rye (*Aroostook*)	150	110	1-2				**P**	**P+**	**P**	**P-**		**P**	**P**	**P+**			**P**
Triticale and Spelt	150	110	1-2				**P**	**P+**		**P-**		**P**	**P+**	**P**			**P**
Wheat	160	120	½-1½	**P+**			**P+**	**P+**		**P-**		**P**	**P+**	**P**			**P**
Barley	160	120	1-2	**P+**			**P**				**P-**	**P**	**P+**	**P**		**P-**	**P**
Oats	140	100	½-1½	**P+**			**P+**				**P-**	**P-**	**P+**	**P**		**P**	**P**
Warm-Season Grains																	
Buckwheat	90	70	½-1½		**P+**	**P+**						**P**	**P+**	**P+**	**P**	**P+**	**P**
Sorghum/Sudangrass	50	35	½-1½		**P+**	**P+**							**P**		**P**	**P+**	**P**
Japanese/Foxtail Millet	35	25	½-1½		**P**	**P**							**P**		**P**	**P+**	**P**
Pearl Millet	30	20	¼-½		**P**	**P**						**P**	**P**	**P**	**P**	**P+**	**P**
Teff	10	8	0-¼		**P**	**P**							**P**		**P**	**P+**	**P**
Legumes																	
Red Clover	15	10	¼-½	**P+**			**P+**			**P**	**P**		**P**				**P**
White or Alsike Clover	12	8	¼-½	**P+**	**P**		**P+**			**P**	**P**		**P**				**P**
Berseem Clover	20	15	¼-½	**P+**	**P+**	**P**	**P-**			**P-**	**P-**		**P-**		**P-**	**P**	**P**
Sweetclover	20	15	¼-½	**P**			**P**			**P-**	**P-**	**P-**	**P**				**P**
Crimson Clover	30	20	¼-½	**P+**	**P+**	**P**	**P**			**P-**	**P-**	**P**	**P**	**P+**		**P-**	**P**
Alfalfa	20	15	¼-½	**P+**			**P**						**P**			**P-**	**P**
Hairy Vetch	35	25	½-1½				**P+**			**P-**	**P-**	**P-**	**P-**	**P+**	**P-**	**P**	**P**
Chickling Vetch	70	50	½-1½	**P+**	**P**	**P-**				**P-**	**P-**	**P-**	**P-**	**P**		**P**	**P**
Field Pea	140	100	1-3	**P+**	**P**		**P+**					**P+**	**P+**	**P**		**P**	**P**
Soybean	120	90	1-2	**P**	**P**							**P**	**P+**	**P-**		**P**	**P**
Cowpea	140	100	¾-1½		**P**	**P+**						**P-**	**P+**	**P-**	**P-**	**P**	**P**
Brassicas																	
Radish or Turnip	15	10	¼-½				**P+**			**P**	**P**	**P**	**P+**	**P**	**P-**	**P**	**P**
Mustard or Canola	15	10	¼-¾	**P+**	**P**		**P+**			**P**	**P**	**P-**	**P**	**P**	**P-**	**P**	**P**
Arugula	4	3	¼-½				**P+**						**P+**				**P**
Grasses																	
Annual Ryegrass	30	20	0-½	**P+**	**P**	**P-**	**P+**			**P+**	**P**	**P**	**P+**			**P-**	**P**
Perennial Ryegrass	35	25	0-½	**P+**		**P-**	**P+**			**P-**	**P-**		**P+**			**P-**	**P**
Orchardgrass	20	15	0-½	**P+**		**P-**	**P+**			**P-**	**P-**		**P+**				**P**
Timothy	15	10	0-½	**P+**		**P-**	**P+**						**P+**				**P**

Reliability: Above Average (P+); Average (P); Below Average/Unknown (P-). Blank = Not Recommended