United States Department of Agriculture
Natural Resources Conservation Service

How to Establish Cover and Green Manure Crops

Wisconsin Job Sheet 340

Landowner:_____**Tract(s):**_____
Date:_____

Definition

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

Purposes—Benefits of Cover Crops

-maintain or reduce soil loss,
-sustained or increased soil conditioning index
-sustained or reduced soil tillage intensity rating
-biological nitrogen fixation and or reduced energy use
-weed suppression
-excess nutrients sequestered
-biomass production
-increases forage production
-reduced compaction
-increased bio-diversity
-increased food for animals and beneficial pollinators.

Conditions Where Practice Applies

This practice applies on all lands requiring vegetative cover for natural resource protection.

Plans and Specifications

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

- seedbed preparation,
- recommended seeding dates,
- seed mixture(s),
- seeding rates,
- planting method
- rates and timing of nutrient applications, and
- planned dates and method of terminating the cover crop.

Example Pure Live Seed (PLS) Rate Calulation:

- Step 1—Determine the seeding rate of each of specie. For example: 80 PLS pounds per acre of Spring Barley is planned.

- Step 2—Multiply the percent purity by the percent germination of each specie based on seed tag information. For example: 98% purity X 60% germination equates to 0.588% PLS.

- Step 3—Divide the seeding rate by the percent PLS to find the bulk seed needed per acre. For example:
80 lbs of Spring Barley per acre / 0.588% PLS = 136 lbs/acre.

The adjusted pure live seeding rate of 136 pounds of Spring Barley per acre is required to meet the seeding criteria for this example.

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Considerations

-Mixtures of two or more cover crops are often more effective than a single cover crop.

-Grasses utilize more soil nitrogen, and legumes utilize both nitrogen and phosphorus.

-Avoid cover crop species that attract potentially damaging insects or diseases.

-Seed produced by cover crops may provide weed competition to subsequent crops.

-For long-term weed suppression, consider planting perennials and/or biennial cover crop species.

-Use plant species that enhance biofuel opportunities.

-Use deep-rooted species to maximize nutrient recovery.

Operation and Maintenance

-Terminate cover crop according to design (timing/method) to prevent negative impact on primary crop (moisture depletion/shading/re-seeding).

-Maintain adequate biomass on the soil surface to meet the intended use of the practice if the cover crop will be grazed or harvested.

-Time cover crop establishment to maximize competition with weeds and volunteer plants.

-Control competition from volunteer plants and shading.

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

-Evaluate the condition of the cover crop prior to planting the next crop in the rotation to ensure, the cover crop has been uniformly terminated according to the plan.

-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 specie of cover crops or consider other management activities.

References

USDA, NRCS Wisconsin Field Office Technical Guide (FOTG), Section IV, Practice Standard 340 Cover Crop.

USDA, NRCS Wisconsin Agronomy Technical Note 7, Cover and Green Manure Crop Benefits to Soil Quality.

Midwest Cover Crop Council: http://www.mccc.msu.edu/index.htm

Midwest Cover Crop Decision Tool: http://mcccdev.anr.msu.edu/

Cover Crops on the Intensive Market Farm, University of Wisconsin – Madison, Center for Integrated Agricultural Systems, College of Agricultural and Life Sciences.

"NRCS Cover Crop Terminations Guidelines"

Table 1
Common Cover Crops Recommended for Planting in Wisconsin

Species	Seeding Rate Drill / Broadcast	Seeding Date (statewide)	Planting Depth (inches)
Grasses			
Annual Ryegrass (Lolium multiflorum)	22-33 lbs/ac	4/10-6/1, 8/1-9/1	¼ to ½
Barley, Spring (Hordeum vulgare)	55-83 lbs/ac	4/10-6/15, 7/15-9/1	¾ to 1½
Japanese Millet (Echinochloa frumentaceae)	22-28 lbs/ac	6/1-7/15	½ to ¾
Sorghum-Sudangrass (Sorghum bicolor x S. bicolor var. Sudanese)	28-33 lbs/ac	6/1-7/15	½ to 1½
Sudangrass (Sorghum biclor)	28-33 lbs/ac	6/1-7/15	½ to 1
Pearl Millet (Pennisetum glaucum)	22-28 lbs/ac	6/1-7/15	½ to ¾
Wheat, Spring (Triticum aestivum)	65-165 lbs/ac	4/10-6-15,7/15-9/1	¾ to 1½
Barley, Winter (Hordeum vulgare)	55-83 lbs/ac	8/15-10/1	¾ to 1½
Cereal Rye, Winter (Secale cerale)	65-150 lbs/ac	7/15-10/15	¾ to 1½
Oats (Avena sativa)	33-110 lbs/ac	4/10-9/1	½ to 1
Wheat, Winter (Triticum aestivum)	65-165 lbs/ac	8/1-10/1	¾ to 1½
Triticale, Winter (Triticale triticosecale)	65-165 lbs/ac	8/1-10/1	¾ to 1½
Non-Legumes Broadleaf			
Buckwheat (Fagopyrum esculentum)	50-65 lbs/ac	5/15-8/1	½ to 1
Oilseed Radish(Raphanus sativus)	11-22 lbs/ac	4/10-6/15, 7/15-8/15	½ to ¾
Sunflower (Helianthus annus) (part of a mix)	1-2 lbs/ac	6/1-7/15	1 to 1½
Chicory (Cichiorum intybus) (part of mix)	1-2 lbs/ac	4/10-6/1, 8/1-9/1	½ to ¾
Rapeseed/Canola (Brassica napus)	2-6 lbs/ac	4/10-6/15,8/1-8/15	½ to ¾
Forage Turnips (Brassica rapa)	1-5 lbs/ac	4/10-6/15,7/15-8/15	¼ to ½
Legumes			
Alfalfa (Medicago sativa)	13-16 lbs/ac	4/15/-6/1,8/1-8/30	¼ to ½
Berseem Clover (Trifolium alexandrinum)	9-17 lbs/ac	6/1-8/1	¼ to ½
Cowpea (Vigna unguiculata)	55-99 lbs/ac	6-1-7/15	1 to 1½
Field Pea (Pisum satuvum)	65-100 lbs/ac	4/10-6/15	1 to 1½
Hairy Vetch (Vicia villosa)	17-28 lbs/ac	4/10-6/15, 7/15-9/15	1 to 1½
Peas, Winter (Pisum sativum subsp. arvense)	65-100 lbs/ac	8/1-9/1	1 to 1½
Red Clover (Trifolium pretense)	9-13 lbs/ac	4/10-8/15	¼ to ½
White Clover (Trifolium repens)	7-9 lbs/ac	4/15/-6/1,8/1-8/30	¼ to ½
Crimson Clover (Trifolium incarnatum)	11-17 lbs/ac	6/1-8/1	¼ to ½
Recommended Cocktail Mixtures			
Forage/Oilseed Radish(50%)	6-11 lbs/ac	8/1-9/1	¾ to 1
Peas, Winter (50%)	33-50 lbs/ac		
Cereal Rye, Winter (50%)	30-93 lbs/ac	7/15-9/15	½ to 1½
Hairy Vetch(50%)	9-14 lbs/ac		
Annual Ryegrass (60%)	13-20 lbs/ac	4/10-6/1, 8/1-9/1	¼ to ½
Oilseed Radish (40%)	5-9 lbs/ac		
Berseem Clover (50%)	5-9 lbs/ac	6/1-8/1	½ to ¾
Oats (50%)	17-55 lbs/ac		
Oats (60%)	20-66 lbs/ac	4/10-6/15, 7/15-9/1	½ to ¾
Oilseed Radish (40%)	5-9 lbs/ac		
Oats (60%)	20-66 lbs/ac	6/1-6/15, 8/1-9/1	¼ to ½
Peas, Winter (40%)	26-40 lbs/ac		
Oilseed Radish	6-11 lbs/ac	8/1-9/1	¾ to 1
Hairy Vetch	9-14 lbs/ac		

Table 2

Identification and Comparison of Performance and Roles of Each Specie

Species	Use[1]	Attribute Ratings[2]										
		N-Source	Soil Builder	Erosion Fighter	Weed Fighter	Pest Fighter	N-Scavenger	Grazing	Quick Growth	Non-Fragile Residue	Pollinator	Deep Rooted
Alfalfa (Medicago sativa)[3]	C	4	3	3	3	1	2	3	3	1	3	4
Annual Ryegrass (Lolium multiflorum)	C	0	3	3	2	2	3	4	4	2	0	1
Barley, Spring/Winter (Hordeum vulagre)	C	0	3	3	3	1	3	3	3	4	0	1
Berseem Clover(Trifolium alexandrinum)[3]	C	4	2	2	2	1	1	4	2	1	3	1
Buckwheat (Fagopyrum esculentum)	C	0	2	3	3	1	3	1	4	0	4	1
Canola/Rape (brassica napus)	C	0	2	3	2	1	3	4	4	1	3	2
Cereal Rye, Winter (Secale cerale)	C	0	4	4	4	3	4	4	4	4	0	1
Chicory (Cichorium intybus)	E	0	2	2	2	0	2	3	2	1	2	3
Cowpea (Vigna unguiculta)	C	3	2	2	2	0	2	3	3	1	2	1
Crimsom Clover (Trifolium incarnatum)	E	3	2	3	2	1	2	4	3	1	4	1
Field Pea (Pisum satuvum)	C	2	2	2	1	1	1	2	3	1	2	1
Forage Turnips (Brassica rapa)	C	0	1	3	2	0	3	4	3	1	1	1
Forage/Oilseed Radish (Raphanus sativus)	E	0	2	3	3	1	4	3	3	1	3	3
Hairy vetch (Vicia villosa)	C	4	2	2	3	2	1	0	2	1	2	1
Japanese Millet(Echinochloa frumentaceae)	C	0	3	3	3	3	3	3	4	4	1	3
Oats (Avena sativa)	C	0	3	3	3	2	3	4	4	2	0	1
Pea, Winter (Pisum sativum subsp. arvense)	C	2	2	2	1	1	1	2	3	1	2	1
Pearl Millet (Pennisetum glaucum)	C	0	3	3	4	2	3	4	4	4	1	2
Red Clover (Trifolium pretense)[3]	C	4	3	3	3	1	2	4	3	2	4	3
Sorghum-Sudangrass (Sorghum bicolor x S. bicolor var.-Sudanese)	C	0	4	4	4	2	4	4	4	4	2	3
Sudangrass (Sorghum bicolor)	C	0	4	3	4	3	4	4	4	4	2	2
Sunflower (Helianthus annus)	E	0	2	2	2	1	3	1	3	3	3	3
Triticale, Winter (Triticale triticosecale)	C	0	3	3	3	2	3	4	3	4	0	1
Wheat (Spring/Winter) Triticum aestivum	C	0	3	3	3	2	3	4	3	4	0	1
White Clover (Trifolium repens)[3]	C	2	2	1	1	2	3	3	3	3	2	0

[1]Use: C=Common Use – considerable state knowledge regarding species use.

E=Emerging Use – limited state knowledge regarding species use.

[2]Attribute Ratings: 0=Poor, 1=Fair, 2=Good, 3=Very Good, 4=Excellent

[3] Legumes such as alfalfa and red clover may cause bloating of ruminant animals. Take necessary precautions to prevent bloat when grazing cover crops that contain these legumes.

Seeding Mixture Design

Objective of establishing the Cover Crop:_____.

Primary crop scheduled to follow Cover Crop:_____. Pre-plant infield verification of adequate soil moisture is required—document infield moisture conditions in comments section.

Tract (s)_____

Field #	Acres	Specie	Seeding Date Deadline	Design seeding rate lbs./acre	PLS Adjusted seeding rate lbs/acre	Site Prep and Seeding Method	Termination Method

Comments:_____.

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Notes: Failure to plant the seed mixture as designed may result in loss of program benefits. Seeding rates SHALL be adjusted to reflect Pure Live Seed. See Page 1 for an example calculation. If planting is delayed beyond the seeding date deadline a variance from the State Agronomist or Area Resource Conservationist must be requested and approved prior to seeding.

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Certification Requirements For Wisconsin Practice Standards 340—Cover Crop

Verify the results of the pre-plant soil moisture assessment were recorded: ___YES___NO

Verify **site preparation and seeding method** completed as designed:_____YES_____NO
(If NO; record changes on the mixture design sheet and evaluate for compliance with the 340 practice standard).

Verify the "**as planted" seed mixture** matched the original seed mixture design:_____YES___NO
(If NO; record changes on the mixture design sheet and evaluate for compliance with the 340 practice standard).

Verify the "**as planted**" seeding rates were based on **Pure Live Seed** (PLS) per specie in mixture. Documentation SHALL include seed tags and computations used to calculate actual adjusted seeding rate:_____YES_____NO (If NO; obtain the seed quality documentation and complete the PLS calculation. Compare the "**as planted**" seeding rate for compliance with the 340 practice standard).

Verify cover crop was seeded within the **recommended seeding dates** :_____YES_____NO
(If NO; determine whether the seeding was established by the deadline) and (If NO; the Area Resource Conservationist or State Agronomist review and approval will be required).

Verify the location and acres planted on an aerial photo (attach to certification statement).
Date of Field Inspection:_____Total acres planned :_____Actual acres applied:_____.

Verify seeding emergence as: _____uniform or _____non-uniform. (If the Cover Crop stand is non-uniform, evaluate the seeding plan **"as planted"** to determine if the planting will meet the practice intent or if a follow up visit will be required).

Document the average number of plants per square foot: _____.
(If the plants/ft² is less than 10 further evaluation of the site shall be conducted prior to practice approval).

Describe the weed conditions:_____.
Actions needed to address excessive weeds: _____.

Verify the method of Cover Crop termination in the seed mixture design have NOT changed:____YES_____NO (If the planned Cover Crop termination method has changed, document the termination method used, prior to emergence of the main crop.

Was a variance required?_____. If yes, documentation includes the justification and signature of the planner approving the waiver: _____.

I certify that the requirements of practice standard 340, Cover Crop, has been completed according to the criteria and specifications in this standard and requirements of this Job Sheet.

Certified by:_____Date:_____.

TSP or Certified Conservation Planner

Wisconsin Practice Standard 340 Cover Crop—Checklist

Verify the results of the pre-plant soil moisture assessment were recorded: ___YES___NO

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