NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

COVER CROP

(Ac.)

CODE 340

DEFINITION

Crops including grasses, legumes and forbs for seasonal cover and other conservation purposes.

PURPOSES

- Reduce erosion from wind and water.
- Increase soil organic matter content.
- Capture and recycle or redistribute nutrients in the soil profile.
- Promote biological nitrogen fixation and reduce energy use.
- Increase biodiversity.
- Suppress weeds.
- Manage soil moisture.
- Minimize and reduce soil compaction.
- Provided supplemental forage.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on all lands requiring vegetative cover for natural resource protection and/or improvement.

It is most often applied on cropland, especially on sloping land to protect the soil surface during the winter following a low residue crop, or as part of a nutrient management plan where a cover crop is used to immobilize or remove excess nutrients in the soil. A cover crop may also be used to provide temporary cover before establishing a permanent planting.

CRITERIA

General Criteria Applicable To All Purposes

Plant Selection - Select a cover crop to accomplish the intended purpose of the practice and the objectives of the client. The species selected must be compatible with provisions of nutrient management and pest management plans, as applicable. Refer to Table 1 for a listing of cover crops, seeding rates, seeding depths, planting dates, kill dates, and suitable uses. Selection shall be based upon time of year, availability and cost of seed, and geographic location. Adjust the seeding rate as appropriate based on the method of planting.

Site Preparation and Soil Amendments - Site preparation shall be done at a time and manner to ensure successful establishment of the cover crop. Before planting with a conventional drill or by broadcasting, prepare a seedbed by chiseling and/or disking. Seedbed preparation is usually not needed when using a no-till drill, and is generally not possible when overseeding into a standing crop.

Apply lime only if needed based on recent soil test results. Any use of commercial fertilizer and other forms of plant nutrients must be in compliance with Maryland nutrient management regulations, as applicable.

Additional fertilizer shall not be applied prior to planting when the cover crop is intended to benefit water quality by uptake of excess nutrients.

Plant Establishment - For best results, place seeds at a controlled depth with the soil firmed around the seed. Drilling or planting with a

cultipacker-seeder are preferred seeding methods because they optimize seed-soil contact. Other methods may be used, such as broadcasting seed by hand, cyclone seeder, helicopter, or airplane, but these methods usually result in poorer seed distribution and germination, and require higher seeding rates to compensate and provide good coverage.

Plant cover crops as early as feasible within the time period indicated in Table 1. This may be immediately after harvesting the previous crop, or in the case of a late harvest, it may require overseeding before harvest. When planting near the end of the growing season, select a cover crop that will germinate and grow rapidly to help assure a successful stand.

Legume seeds shall be inoculated with the proper, viable Rhizobium bacteria before planting. Keep inoculants as cool as possible before use, and do not use it later than the date indicated on the package.

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

Termination of Cover Crops - Seasonal cover crops shall be terminated by harvest, frost, mowing, tillage, and/or herbicides in preparation for the next crop.

The cover crop can be killed at various growth stages, depending on the purpose of the practice and the producer's objectives.

Do not burn cover crop residue.

In addition to other criteria for non-irrigated cover crop termination, the cover crop termination must be at or before the time periods specified in the attached: ***NRCS Cover Crop Termination Guidelines – Non-Irrigated Cropland***. (See attached).

Additional Criteria to Reduce Erosion from Wind and Water

Cover crop establishment, in combination with other conservation practices, will be timed so that the soil shall be adequately protected during the critical erosion period(s).

Plants selected for cover crops shall have the physical characteristics necessary to provide adequate protection.

The amount of surface and/or canopy cover needed from the cover crop shall be determined using current erosion prediction technology. The cover crop shall be killed as late as feasible to maintain soil surface coverage and prepare the seedbed for the following crop.

Additional Criteria to Increase Soil Organic Matter

Cover crop species shall be selected on the basis of producing high volumes of organic material and/or root mass to maintain or improve soil organic matter.

The NRCS Soil Conditioning Index (SCI) procedure will be used to determine the amount of biomass required to have a positive trend in the soil organic matter subfactor.

The cover crop shall be killed as late as feasible to maximize plant biomass and prepare the seedbed for the following crop.

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

Cover crops shall be established and actively growing before expected periods of high precipitation that can cause leaching. Species shall be selected for their ability to absorb large amounts of nutrients from the root zone of the soil.

When nutrients will not be recycled through a following crop, the above-ground biomass of the cover crop shall be removed from the field if maximum nutrient removal is planned.

Additional Criteria to Promote Biological Nitrogen Fixation and Reduce Energy Use

Plants selected for nitrogen fixation shall consist of legumes or legume/grass mixtures. The specific Rhizobium bacteria for the selected

legume will either be present in the soil or the seed will be inoculated at the time of planting.

Credit for nitrogen contributions from legume cover crops shall be consistent with current University of Maryland Extension recommendations. These credits shall be accounted for in the nutrient management plan.

Legumes shall be killed as late as feasible to maximize nitrogen fixation.

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.

Additional Criteria for Weed Suppression

Species for the cover crop shall be selected for their chemical or physical characteristics to compete with weeds.

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

For long-term weed suppression, perennial and/or biennial species may be used.

Additional Criteria for Soil Moisture Management

Terminate growth of the cover crop sufficiently early to conserve soil moisture for the next crop. Cover crops established for moisture conservation shall be left on the soil surface until the next crop is planted.

On soils with excess soil moisture, allow the cover crop to grow as long as possible to optimize removal of soil moisture.

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 to increase soil organic matter, improve soil structure, and increase soil moisture through better infiltration.

Additional Criteria to Provide Supplemental Forage

Species selected shall have desired forage traits, be palatable to livestock, and not interfere with the production of the next crop.

Forage provided by the cover crop may be hayed or grazed as long as sufficient biomass is left for resource protection. Green-chop or graze the crop when optimal nutritional content and yield is available.

Note: Specific cost-sharing programs or other funding sources may dictate criteria in addition to, or more restrictive than, those specified in this standard.

CONSIDERATIONS

General

For seasonal cover crops, consider the use of annual grasses, including cereal grains. These plants provide satisfactory results at a reasonable cost. In the summer, a warm-season annual grass (such as foxtail millet or pearl millet) can be used as a “half-season” cover crop after an early vegetable crop, before a late crop, and to control weeds while land is out of production for a short period of time.

Consider that plant disease and insect problems can be increased by the use of cover crops. The principle of good rotation in which grasses are alternated with legume crops should help to avoid this problem. For example, corn or wheat should follow legume cover crops, while soybeans are better following small grains.

Avoid cover crop species that attract potentially damaging insects and other crop pests. If using cereal grains as cover crops, consider the need for pest management of Hessian fly, powdery mildew, and other pests common to these crops. Cover crops that can harbor pests or crop

pathogens for the following crop should not be grown just before or adjacent to susceptible crops.

Consider that some cover crops may present a weed problem by volunteer seeding when or where they are not wanted. The vetches and annual ryegrass have this tendency. It is usually not a serious problem and in most cases can be handled through normal weed control practices.

Consider the amount of time needed for germination and sufficient growth before dormancy. Annuals generally germinate more rapidly than perennials, and grasses usually germinate more rapidly than legumes. Rapidly establishing cool-season grass species include annual ryegrass and spring oats, followed by winter wheat and rye. Foxtail millet, pearl millet, and sudangrass are rapidly establishing warm-season species.

Managing Excess Soil Nutrients

If residual nutrients in the soil are a concern, consider species that will provide sufficient uptake of the target nutrients. Grasses utilize more soil nitrogen than legumes, and legumes utilize both nitrogen and phosphorus. Deep-rooted species provide maximum nutrient uptake.

Winter annual grasses, especially cereal grains, can immobilize significant quantities of residual nitrogen left from the previous crop and can reduce the potential for nitrate leaching to the groundwater. The efficiency of these grasses for using residual nitrogen in the fall is (in decreasing order): rye, wheat, barley, oats. The earlier the planting in the fall, the more growth and nutrient uptake will occur before winter dormancy.

Increasing Soil Organic Matter

All cover crops can provide nutrients and organic matter to the soil. Cereal grains, annual ryegrass, millet, sudangrass, and sorghum-sudangrass hybrids serve as good green manure crops. Grasses generally produce more dry matter than legumes, but they also decompose more slowly and are less efficient in conserving soil moisture. Grass/legume mixtures produce more dry matter, provide better early ground cover, and eventually more mulch for soil moisture conservation than either component grown alone.

Promoting Biological Nitrogen Fixation

Consider the use of winter annual legumes to provide nitrogen for a succeeding summer crop. Their use can reduce purchased fertilizer inputs. Three winter annual legume crops that provide significant amounts of nitrogen for the next crop are (in decreasing order): hairy vetch, Austrian winter peas, and crimson clover. Other legumes may be used, but most supply smaller quantities of nitrogen.

However, while legumes can supply large amounts of nitrogen to the summer crop, they provide minimum protection for nitrate leaching from the root zone when compared to cereal grains and other grasses.

Biennial and perennial legumes, although useful for supplying nitrogen and providing ground cover protection for the soil, are best suited as permanent pasture and hay crops in long-term rotations and should not be planted and utilized as annual cover crops.

PLANS AND SPECIFICATIONS

Plans and specifications are to be prepared for the specific fields that will be treated with this conservation practice. The plans and specifications should identify the requirements for establishing and maintaining this practice. Appropriate job sheet(s) can serve as the planting plan and specifications for the practice.

Documentation shall be in accordance with the section "Supporting Data and Documentation" in this standard.

OPERATION AND MAINTENANCE

An operation and maintenance (O&M) plan shall be prepared for each management unit. Appropriate job sheets, fact sheets, or other information sheets may be used to serve as the management plan as well as supporting

documentation, and shall be provided to the client. These sheets shall be referenced in the conservation plan narrative.

At a minimum, the following components shall be addressed in the O&M plan, as applicable:

1. Describe the extent of management needed to manage the cover crop for the desired period of time. Management may consist of mowing, mechanical harvesting, prescribed grazing, nutrient management, pest management, or other actions, as appropriate;
2. Control weeds as needed by mowing or by spraying with an appropriate herbicide. To the extent feasible, "spot" spray or mow to control weeds so that desirable cover is not destroyed unnecessarily. Noxious weeds must be controlled as required by state law. Weed control must be part of a pest management plan;
3. If forage use is desired, green-chop or graze the cover crop in the late boot to early head stages when optimal nutritional content and yield is available;
4. For all purposes other than supplemental forage, kill a grass cover crop no later than the late joint to early boot stage, or no later than 2 to 4 weeks before planting the next crop. This timing of the kill date permits maximum growth of the cover and maximum uptake of residual nutrients while allowing sufficient time for the decomposition of the vegetation, release of nutrients, and recharge of soil moisture;

   Legumes killed while succulent decompose more rapidly than grasses, so killing a legume cover crop 1 to 2 weeks before planting the next crop is usually sufficient;
5. When optimum wildlife habitat is desired, do not mow or mechanically harvest fields during the nesting season of the desired wildlife species. For Maryland, the primary nesting season is generally from April 15 through August 15;
6. Describe the acceptable uses (e.g., grazing, haying) and time of year/frequency of use restrictions, if any.

SUPPORTING DATA AND DOCUMENTATION

The following is a list of the minimum data and documentation to be recorded in the case file:

1. Extent of planting in acres, field number where the practice is located, and the location of the practice marked on the conservation plan map;
2. Assistance notes shall include dates of site visits, name or initials of the person who made the visit, specifics as to alternatives discussed, decisions made, and by whom;
3. Completed copy of the appropriate job sheet(s) or other specifications, and management plans. Specify the following for each field, or groups of fields:
   a. Purpose of the planting;
   b. Soil loss calculations if erosion control is a purpose;
   c. Plant species, varieties, method and rate of planting, and planting dates;
   d. Kill methods and kill dates;
   e. Other management requirements, as appropriate.

REFERENCES

1. Baldwin, K.R., and N.G. Creamer. Cover Crops for Organic Production Systems. North Carolina State University, Center for Environmental Farming Systems. Available on the internet at:

   http://www.cefs.ncsu.edu/resources/organicproductionguide/covercropsfinaljan2009.pdf
2. Decker, A.M., A.J. Clar, J.J. Meisinger, F.R. Mulford, and V.A. Bandel. 1992. Winter Annual Cover Crops for Maryland Corn Production Systems. University of Maryland, Agronomy Mimeo 34.

3. Hartwig, N. L. Crownvetch and No-Tillage Crop Production for Soil Erosion Control. Cooperative Extension Service, Pennsylvania State University.

4. Penn State University, 2009. The Agronomy Guide, 2009-2010. College of Agricultural Sciences. Available on the internet at:

   http://agguide.agronomy.psu.edu/

5. Sustainable Agriculture Network. Managing Cover Crops Profitably. 3rd Edition. 2007. Cooperative State Research, Education, and Extension Service, USDA, the University of Maryland and the University of Vermont.

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

Figure 1: USDA Plant Hardiness Zones for Maryland

http://planthardiness.ars.usda.gov/PHZMWeb/

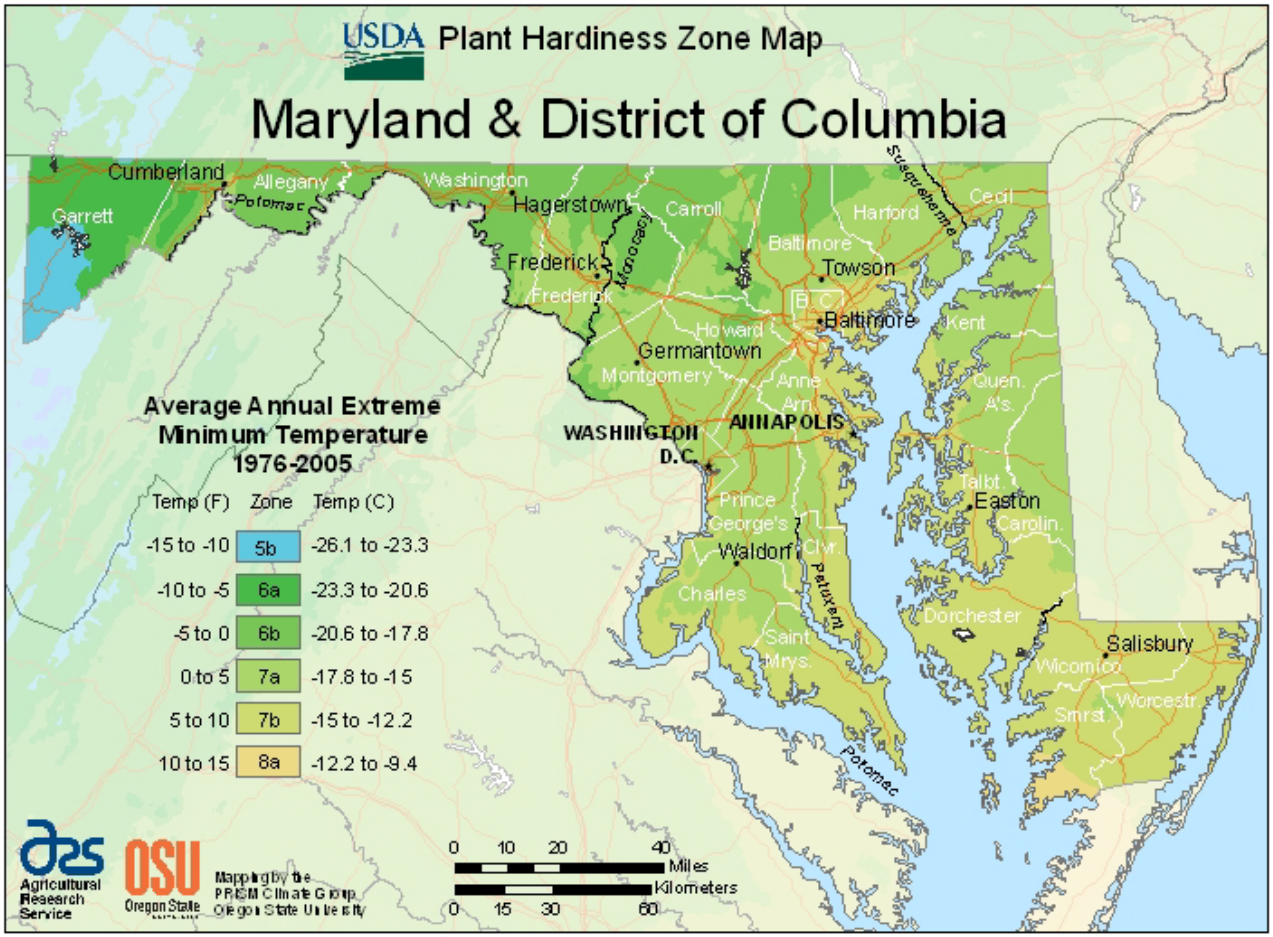

TABLE 1: RECOMMENDED COVER CROPS

Species	Seeding Rate (lbs/ac) [1]	Seeding Depth (inches) [2]	Suitable Uses [3]							Planting Dates [4]			Kill/Suppression Dates [5]		
			E	G	N	O	P	S	W	PHZ 5b-6a	PHZ 6b	PHZ 7a-7b, 8a	PHZ 5b-6a	PHZ 6b	PHZ 7a-7b, 8a
SUMMER ANNUAL GRASSES															
Foxtail (German) Millet *Setaria italica*	25 (20-30)	0.5 - 1.0	●			●		●	●	N/A	6/1–7/15	5/15–7/1			
Pearl Millet *Pennisetum glaucum*	20 (15-20)	0.5 - 1.0	●			●		●	●	N/A	6/1–7/15	5/15–7/1			
Sorghum x Sudangrass Hybrids *Sorghum bicolor*	25 (20-30)	0.5 - 1.0	●			●		●	●	6/1–7/15	5/15–7/1	5/1–6/15			
Sudangrass *Sorghum bicolor*	30 (20-40)	0.5 - 1.0	●			●		●	●	6/1–7/15	5/15–7/1	5/1–6/15			
SUMMER ANNUAL FORBS & LEGUMES															
Buckwheat *Fagopyrum esculentum*	80 (40-120)	0.5 - 1.0	●			●	●	●	●	6/1–7/1	6/1–7/1	5/15–7/1	No later than 1 to 2 weeks before planting the next crop		
Annual Lespedeza: Korean *Kummerowia stipulacea* or Common *K. striata*	15 (12-20)	0.25 - 0.5	●		●	●				N/A	3/25–4/20	3/20–4/15			
Soybeans *Glycine max*	105 (90-120)	1.0 - 1.5			●	●			●	6/1–7/1	5/25–7/1	5/15–7/1			

Additional Notes for this table are located on Page 13

TABLE 1: RECOMMENDED COVER CROPS

Species	Seeding Rate (lbs/ac)[1]	Seeding Depth (inches)[2]	Suitable Uses[3]							Planting Dates[4]			Kill/Suppression Dates[5]		
			E	G	N	O	P	S	W	PHZ 5b-6a	PHZ 6b	PHZ 7a-7b, 8a	PHZ 5b-6a	PHZ 6b	PHZ 7a-7b, 8a
WINTER ANNUAL GRASSES															
Annual Ryegrass *Lolium perenne* spp. *multiflorum*	20 (15-50)	0.25 - 0.5	●	●		●		●	●	8/1–10/15	8/15–11/1	9/1–11/15	No later than 2 to 4 weeks before planting the next crop.		
Spring Oats *Avena sativa*	95 (60-125)	1.0 - 1.5	●	●		●		●	●	8/1–9/15	8/15–10/1	9/1–10/15	No later than 2 to 4 weeks before planting the next crop. (Oats are likely to winter-kill in PHZ 5b, 6a, and 6b.)		
Triticale (*Triticum* x *Secale*)	120 (90-150)	1.0 - 1.5	●	●		●		●	●	8/1–10/25	8/15–11/5	9/1–11/15	No later than 2 to 4 weeks before planting the next crop.		
Winter Barley *Hordeum vulgare*	120 (90-150)	1.0 - 1.5	●	●		●		●	●	8/1–10/1	8/15–10/15	9/1–11/1			
Winter (Cereal) Rye *Secale cereale*	120 (90-150)	1.0 - 1.5	●	●		●		●	●	8/1–11/5	8/15–11/15	9/1–11/25			
Winter Wheat *Triticum aestivum*	105 (90-120)	1.0 - 1.5	●	●		●		●	●	8/1–10/25	8/15–11/5	9/1–11/15			
WINTER ANNUAL LEGUMES															
Austrian Winter Pea *Pisum sativum*	80 (60-100)	1.0 - 1.5	●		●	●		●		8/1–9/15 [6]	8/15–10/1	9/1–10/15	No later than 1 to 2 weeks before planting the next crop.		
Bigflower Vetch *Vicia grandiflora*	35 (25-40)	0.5 - 1.0	●		●	●		●		8/1–9/15 [6]	8/15–10/1	9/1–10/15			
Common Vetch *Vicia sativa*	60 (25-90)	0.5 - 1.0	●		●	●		●		8/1–9/15 [6]	8/15–10/1	9/1–10/15			
Hairy Vetch *Vicia villosa*	20 (15-25)	0.5 - 1.0	●		●	●	●	●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15			
Crimson Clover *Trifolium incarnatum*	15 (10-20)	0.25 - 0.5	●		●	●		●		N	8/15–10/1	9/1–10/15			

Additional Notes for this table are located on Page 13

TABLE 2: RECOMMENDED COVER CROP MIXES

Species	Seeding Rate (lbs/ac)[1]		Seeding Depth (inches)[2]	Suitable Uses[3]							Planting Dates[4]			Remarks
	Drilled	Broadcast		E	G	N	O	P	S	W	PHZ 5b-6a	PHZ 6b	PHZ 7a-7b, 8a	
WINTER ANNUAL GRASS/LEGUMES/BRASSICAS MIXTURE 1: SELECT ONE SPECIES/CATEGORY														
****Select one GRASS***														
Rye, Wheat, Barley Triticale Secale cereal, Triticum aestivum, Hordeum vulgare, Tritiucm x Secale, respectively	35-45	45-55	0.25 - 0.5	●	●		●		●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	Kill down, no later than 1 to 2 weeks before planting the next crop.
Oats *Avena sativa*	50-55	55-60	0.25 - 0.5	●	●		●		●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	These cover crops may entirely winter kill, depending on geographic location and/or the severity of the winter.
Annual Rye Grass *Lolium perenne spp. Multiflorum*	15	20	0.25 - 0.5	●	●		●		●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	Research suggests Hairy Vetch is a better phosphorus scavenger than other legumes.
****Select one LEGUME***														
Berseem Clover *Trifolium alexandrinum*	8-12	15-20	0.25 - 0.5	●		●	●		●		8/1–9/15 [6]	8/15–10/1	9/1–10/15	Brassicas/tillage radish: lower rates work well if planted early (mid-Aug. to early Sept.). Higher rates may be needed if planted later (mid-Sept. – Oct.)
Hairy Vetch *Vicia villosa*	15-20	25-30	0.25 - 0.5	●		●	●	●	●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	
Crimsom Clover *Trifolium incarnatum*	8-12	15-20	0.25 - 0.5	●		●	●		●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	
****Select one BRASSICAS***														Tillage radish is an excellent choice for reduction of soil compaction.
Tillage radish Brassicas	2	3-4	0.25 - 0.5	●	●		●		●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	When using Annual Ryegrass in the mixture plant to a depth of 0.5 inches.
Winter Rape (or Canola) Kale, Turnips Brassica napus, B. rapa	2	3-4	0.25 - 0.5	●		●			●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	

Additional Notes for this table are located on Page 13

TABLE 2: RECOMMENDED COVER CROP MIXES

Species	Seeding Rate (lbs/ac)[1]		Seeding Depth (inches)[2]	Suitable Uses[3]							Planting Dates[4]			Remarks
	Drilled	Broadcast		E	G	N	O	P	S	W	PHZ 5b-6a	PHZ 6b	PHZ 7a-7b, 8a	
WINTER ANNUAL GRASS/LEGUMES MIXTURE 2: SELECT ONE SPECIES/CATEGORY														
****Select one GRASS***														
Rye, Wheat, Barley Triticale Secale cereal, Triticum aestivum, Hordeum vulgare, Tritiucm x Secale, respectively	35-45	45-55	0.25 - 0.5	●	●		●		●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	Kill down, no later than 1 to 2 weeks before planting the next crop. These cover crops may entirely winter-kill, depending on geographic location and/or the severity of the winter. Research suggests Hairy Vetch is a better phosphorus scavenger than other legumes
Oats *Avena sativa*	50-55	55-60	0.25 - 0.5	●	●		●		●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	
Annual Rye Grass *Lolium perenne spp. multiflorum*	15	20	0.25 - 0.5	●	●		●		●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	
****Select one LEGUME***														
Berseem Clover *Trifolium alexandrinum*	8-12	15-20	0.25 - 0.5	●		●	●		●		8/1–9/15 [6]	8/15–10/1	9/1–10/15	
Hairy Vetch *Vicia villosa*	15-20	25-30	0.25 - 0.5	●		●	●	●	●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	
Crimsom Clover *Trifolium incarnatum*	8-12	15-20	0.25 - 0.5	●		●	●		●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	

Additional Notes for this table are located on Page 13

TABLE 2: RECOMMENDED COVER CROP MIXES

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	Drilled	Broadcast		E	G	N	O	P	S	W	PHZ 5b-6a	PHZ 6b	PHZ 7a-7b, 8a	
WINTER ANNUAL GRASS/BRASSICAS MIXTURE 3: SELECT ONE SPECIES/CATEGORY														
****Select one GRASS***														
Rye, Wheat, Barley Triticale Secale cereal, Triticum aestivum, Hordeum vulgare, Tritiucm x Secale, respectively	35-45	45-55	0.25 - 0.5	●	●		●		●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	Kill down, no later than 1 to 2 weeks before planting the next crop.
Oats *Avena sativa*	50-55	55-60	0.25 - 0.5	●	●		●		●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	These cover crops may entirely winter-kill, depending on geographic location and/or the severity of the winter.
Annual Rye Grass *Lolium perenne spp. multiflorum*	15	20	0.25 - 0.5	●	●		●		●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	Brassicas/tillage radish: lower rates work well if planted early (mid Aug. to early Sept.). Higher rates may be needed if planted later (mid Sept. – Oct.)
****Select one BRASSICAS***														
Tillage radish Brassicas	2	3-4	0.25 - 0.5	●	●		●		●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	Tillage radish is an excellent choice for reduction of soil compaction.
Winter Rape (or Canola) Kale, Turnips Brassica napus, B. rapa	2	3-4	0.25 - 0.5	●		●			●	●	8/1–9/15 [6]	8/15–10/1	9/1–10/15	When using Annual Ryegrass in the mixture plant to a depth of 0.5 inches.
WINTER ANNUAL BRASSICAS[7]														
Winter Rape (or Canola) Kale, Turnips Brassica napus, B. rapa	6-8	12-16	0.25 - 0.5	●		●			●	●	8/1-9/15[6]	8/15 – 10/1	9/1 – 10/15	

Additional Notes for this table are located on Page 13

NOTES FOR TABLES 1 AND 2:

[1] **Seeding Rate:** The primary seeding rate should be used if broadcast seeding and cultipacking with average seedbed conditions. A seeding range is also given, in parentheses. When an optimum seedbed can be prepared or when a drill is used, use the rate at the low end of the range. When broadcast seeding without cultipacking, planting later than the ideal period, or planting in a rough seedbed, use the rate at the high end of the range. If aerial seeding, increase the seeding rate by at least 50%.

When calculating a 50% increases for aerial seeding use 1.5 x the drilled seeding rate/individual species.
When calculating a 30% increases for aerial seeding use 1.3 x the drilled seeding rate/individual species.

[2] **Seeding Depth:** Provides the recommended depth to plant seed to obtain the best germination. Plant deeper in sandy soil, and less deep on clayey soil.

[3] **Suitable Uses:** Lists the benefits obtained from each species or mix:
E - Erosion control and surface water protection;
G - Ground water protection from nitrate leaching;
N - Nitrogen fixation;
O - Organic matter added;
P - Phosphorus and micronutrients recycling;
S - Soil structure improved;
W - Weed suppression.

[4] **Planting Dates:** Preferred planting dates are listed based on Plant Hardiness Zones (see Figure 1). Successful establishment of the planting will vary with environmental conditions, but is more likely to occur if the crop is planted near the beginning of the planting period. Planting before the earliest date is permissible when weather conditions are favorable. In order to allow sufficient time for growth, the latest planting date should rarely be exceeded.

[5] **Kill/Suppression Dates:** The preferred timing for killing the cover crop or suppressing growth of the crop. Harvesting or herbicide treatment may be used, or the crop may be plowed under, depending on the purpose and desired use of the cover crop.

[6] The latest planting date for Zones 5b and 6a should be no later than 9/1 at elevations higher than 600 feet.

[7] **"Brassica" cover crops** (family Brassicaceae) include rape, kale, mustard, turnips, etc. Canola is a term for rape cultivars that are used to produce oil and other products for human and livestock consumption. Oil from other rape varieties is less palatable and is used for industrial purposes. All rape varieties are suitable for use as cover crops.

Brassicas can be especially useful for planting after early vegetable crops. Brassica cover crops are well-suited for uptake of residual nitrogen in the fall because they grow rapidly during periods of cool weather. They may also provide other benefits such as suppression of detrimental nematodes, plant diseases, weeds, and reduce soil compaction.

There are a few drawbacks to using Brassica cover crops: (1) Brassicas have low tolerance for poorly drained or frequently flooded soils; (2) Plants are susceptible to below freezing temperatures, and may winter-kill, especially in colder regions of Maryland. It is important that they be well-established (6 to 8 leaf stage) before a hard freeze in order to provide the benefits of a cover crop; (3) if allowed to set seed, these plants may become "weedy" in crop fields.