



**Practice Specification
Cover Crop (Code 340)
Specification Guide Sheet**

SCOPE:

This work will consist of establishing close growing grasses, legumes, and forbs for seasonal cover and other conservation purposes including but not limited to:

- Reduce sheet, rill and wind erosion
- Maintain or increase soil organic matter quantity
- Improve soil organic matter quality
- Improve soil aggregate stability
- Improve habitat for soil organisms
- Reduce water quality degradation by utilizing excessive soil nutrients
- Reduce weed and plant pest pressure
- Improve moisture management
- Reduce soil compaction
- Supply nitrogen to the subsequent crop

GENERAL SPECIFICATIONS APPLICABLE TO ALL PURPOSES:

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.

SELECTING COVER CROPS:

Select single species or species mix from the **Tables 1a-1e** that will meet the objectives of the site-specific conservation plan. Ensure that cover crop species selected have the proper growth and biomass production characteristics that will complement the time period(s) needing resource protection or enhancement. Species outlined assume typical cropland soil conditions with adequate natural or artificial drainage.

Ensure that crops are compatible with the cropping system and soils. Detailed descriptions of cover crops can be found in ***Managing Cover Crops Profitably*** publication or the ***Cornell Cover Crop Guide***.

MATERIALS:

Where cover crop is applied to certified organic cropland, all materials will meet the ***National Organic Program*** (and ***Vermont Organic Farmers***) standards approved and meet minimum requirements outlined below.

(a) Seed:

All purchased seed shall conform to the current rules and regulations of Vermont Agency of Agriculture, Food & Markets and shall meet or exceed the standards for purity and germination of pure live seed (80% germination). No seed will be used with a date of test more than 12 months old. All purchased seed shall be fully tagged or certified by a commercial supplier. Seed that has become wet, moldy or otherwise damaged in transit or storage shall not be used. Farm produced seed shall be germination tested (also to meet 80% germination), as to ensure accurate pure live seeding rates to meet the criteria in this document.

(b) Inoculants:

The inoculant for treating legume seeds shall be a pure culture of nitrogen-fixing bacteria prepared specifically for the species.

(c) Organic cropland:

Where cover crop is applied to certified organic cropland, all materials will meet the National Organic Program (and Vermont Organic Farmers) standards approved and meet minimum requirements outlined above.

ESTABLISHING COVER CROPS:

Cover crops may be established using a variety of methods, including broadcasting, interseeding, drilling, frost/dormant seeding, manure slurry seeding, and aerial seeding.

(a) Application of Soil Amendments:

Cover crops are not typically fertilized when used for resource concerns such as scavenging nitrogen or reducing P transport. When applying manure after cover crop emergence, ensure the crop has grown sufficiently to prevent damage to seedlings from spreading equipment. Applications of soil amendments must meet the Vermont Nutrient Management (590) standard and Required Agricultural Practices (RAPs) where applicable.

(b) Timing of Seeding:

The latest seeding dates for the primary season requiring cover crops are provided in **Tables 1b-d**. For winter cover crops only, refer to the USDA Plant Hardiness Zone Maps (Figure 1) for latest seeding date adjustments based on specific location where cover crop will be planted. Locations within USDA Plant Hardiness Zones 3b-5a require the use of the latest seeding dates listed in the **Tables 1b-1d**. Latest winter cover crops seeding dates may be adjusted up to 5 days later from the latest seeding dates relative to dates in **Tables 1b-1d** for the areas located in USDA Plant Hardiness Zone 5b. See attached map.

(c) Seedbed Preparation:

The seedbed shall be adequate to ensure seed/soil contact and weed control for successful cover crop establishment. Prepare a seedbed with minimal disturbance by harrowing, cultivating, disking or no-till drilling where practical. Seedbed preparation shall be discontinued when soil moisture conditions are not suitable for the preparation of a satisfactory seedbed or when equipment use will compact the soil. Broadcast or aerial seeding without tilling shall be only when seeding can be timed to coincide with soil surface conditions that will result in adequate seed-soil contact.

The key to successful seeding is to get the seed in contact with moisture. Under dry conditions, drilling is essential. If the soil surface is moist, broadcasting without covering can be effective. Good seeding growth requires continued moisture.

(d) Seed Inoculation:

Inoculate legumes with the proper fresh culture no more than 8 hours prior to sowing unless pre-inoculated coated seed is used. If hydro-seeding is used, inoculate immediately prior to hydro-seeding. Use four times the recommended inoculant when hydro-seeding. Inoculant shall be used no later than the date indicated on the container or as otherwise specified. Inoculant will be stored according to manufacturer's recommendations until ready for use. A mixing medium, as recommended by the manufacturer, shall be used to bond the inoculant to the seed. When used with hydro-seeding equipment with fertilizer in the mix, the inoculant shall be added last and it shall not remain in the seeder longer than 4 hours.

(e) Inter-seeding:

Where the cover crop is to be inter-seeded into the growing crop, seed cover crop just following cultivation (for weed control or fertilizer sidedress) or by use of a specialized drill that can seed between rows of the main crop. Interseeding is most successful if good seed to soil contact is present as well as adequate moisture. Inter-seeded cover crops must be timed so as not to adversely affect main crop growth and development. The cover crop will begin to establish a shallow root system but will not be overly competitive due to shading by the major crop. Soil disturbance should be between all rows.

Herbicides used for the primary crop must be compatible with the inter-seeded cover crop. Guidance can be found in Penn State Extension “Herbicide Carryover Table”. Broadcast inter-seeding without tilling will follow broadcast requirements in (c) *Seedbed Preparation* above. Often seeding can be combined with a final cultivation.

(f) Seeding Depth:

Follow seeding depths specified in **Tables 1b-d** for species and/or species mix selected or follow specification for un-tilled broadcast seeding (c) *Seedbed Preparation* above.

SEEDING MIXTURES:

Guidance for seed mixtures is provided in **Table 1c-e**. In addition, a seed rate calculator for novel mixes can be found by Green Cover Seed.

Legumes will be inoculated with the proper viable rhizobia before planting. For best results, consider selecting pre-inoculated, coated seed when available.

Common mixes for VT include a small grain like winter rye or oats with hairy vetch, red clover or peas. Other common mixes include annual ryegrass, brassicas and clovers, sorghum sudangrass or millets with soybean or cowpea. Run a small-scale trial on unfamiliar combinations to determine if they will work..

If soil health is an objective, at least three different grasses, legumes or forbs are generally used to provide maximum diversity. Maximum soil health benefits are obtained when cover crops are allowed to develop high amounts of biomass and have vigorous, expansive root systems.

Seed mixtures can be developed to achieve any number of benefits. Refer to Making the Most of Mixtures to develop mixtures to accomplish specific goals on your farm.

GREEN MANURE CROPS:

The manure in the green manure refers to nutrients produced by the crop. Winter cover crops are planted primarily to prevent soil erosion and capture excess nutrients. Green manure crops are grown during the mid-season primarily to increase nitrogen fertility, soil organic matter, suppress weeds, and to improve soil structure and tilth.

The goal of the green manure is to produce fertility and organic matter; the cover crop should be terminated when these goals are met.

Generally green manures are legumes, but other species can be used also. Caution: Winter cereal grains may produce a large volume of carbonaceous material that may tie up nitrogen for the following crop if terminated too late.

LIVING MULCHES:

Vegetables crop producers should consider using living mulches to prevent erosion, improve soil structure and microbial population, improve water relations, and provide beneficial insect habitat. 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 seeding the alley with a living mulch is a management practice that is becoming popular. Typically living mulches should be low growing and tolerate mowing.

GRAZING:

Cover crops can be grazed prior to termination, providing a high-quality source of forage and potentially adding additional value to the cover crop. Prior to grazing make sure there are no potential hazards to grazing livestock. For example:

1. Sorghum and sudangrass species may cause prussic acid and nitrate poisoning if the young growth is grazed or if the crop is grazed after frost,
2. Alsike clover may cause photosensitivity in horses and other livestock (especially white-skinned animals),

3. Turnips may cause copper toxicity in sheep,
4. Red clover contains phytoestrogens that may complicate sheep breeding, and
5. Many of the legumes may cause bloat and caution should be taken, especially in pure stands.

TERMINATING COVER CROPS:

Cover crops will be terminated by frost, harvest or grazing for forage, roller crimping, tillage, and/or with proper herbicide selection. Timely termination of in season cover crops is required to reduce soil moisture depletion, nitrogen immobilization, allelopathy and to prevent unwanted re-seeding. Timing of cover crop termination must meet the purpose of the cover crop as specified in the conservation plan. Manage cover crop surface residue and biomass production to meet objectives specified in the conservation plan. In vineyards and small fruit operations, grow cover crop in aisles, mow as necessary for mulch cover and maintain as short stubble. Adjust nitrogen application rates for the subsequent crop based on nitrogen credits for specific cover crop species from University of Vermont nutrient guidelines.

Cover crops can be terminated as much as 5 days after the main crop is planted, but must be terminated prior to crop emergence, **NRCS Cover Crop Termination Guidelines – Non-irrigated Cropland.**

Cover crops will be terminated by cold temperatures, harvest or grazing for forage, roller crimping, tillage, and/or with proper herbicide selection. Timely termination of in-season cover crops is required to minimize soil moisture depletion, nitrogen immobilization, potential issues with allelopathy, and to prevent unwanted re-seeding. In vineyards and small fruit operations, grow cover crop in aisles, mow as necessary for mulch cover and maintain as short stubble.

Time of cover crop termination must coincide with the goals of the cover crop as specified in the conservation plan. The cover crop surface residue and overall biomass production must also meet the objectives specified in the conservation plan. Nitrogen rates for the subsequent crop should be modified based on timing of termination and species of cover crop, Cover Crops and Nitrogen Credits.

Cover crops should be terminated before the main crop emerges, see NRCS Cover Crop Termination Guidelines.

In general, terminate cover crops 1-2 weeks prior to planting the cash crop. “Planting green” can be effective also, depending on the cover/cash crop system. Small grain cover crops should be at least 12-18 inches high. No-till systems cover crops can be terminated on the same day as planting, such as with a roller-crimper. Note that winter cereal grains, such as rye, may produce a large volume of carbonaceous material that may tie up nitrogen for the following crop.

Avoid future weed problems by ensuring that cover crops are terminated prior to seed set (unless a reseeding of cover is the goal).

(a) Herbicide Termination:

Herbicide selection for termination must be made by a Vermont State Certified Pesticide Applicator, Certified Crop Advisor or qualified Extension Specialist following pesticide labeling and must be compatible with the following main crop to be grown.

(b) Winter Kill Termination:

When using winter terminated cover crops, ensure that planned cover and biomass production levels can be achieved for the specific cover crop objectives outlined in the conservation plan.

(c) Grazing/Haying Termination:

If terminating the cover crops through grazing or forage harvest, the amount of target residual biomass specified in the conservation plan must be left in the field following harvest. Employ additional termination methods as needed once grazing/haying has concluded and target biomass is achieved and documented. As previously documented, cover crop consumption by grazing animals must always be considered and monitored.

(d) Tillage Termination:

A variety of tillage implements can be successfully used to terminate a cover crop to meet the requirements of conservation and agronomic production.

(e) Roller-Crimper/Mowing Termination:

Rolling/crimping or mowing will take place at the proper cover crop growth stage to limit regrowth potential. In the case of small grains (winter rye, wheat, triticale, barley) this stage is at full anthesis (full flower formation and pollen shedding) and for annual legumes termination should occur at the flowering stage (and pod development for vetch). Direction of rolling/crimping will coincide with planting direction when planting the subsequent crop.

COMMON COVER CROPS, SEEDING RATES AND LATEST SEEDING DATE TABLES FOR VERMONT:

(a) The correct table used for species selection must correspond to the purpose outlined in a site-specific conservation plan.

(b) Cover crops will be seeded no later than the dates shown on the appropriate table. Planting at the latest seeding date will result in a minimal cover crop performance level for the purpose given. For optimal cover crop establishment and growth, seed earlier than the latest seeding dates indicated.

(c) Seeding will be at rates no less than the seeding rate specified from the appropriate table. Seeding rates in the tables are for the seeding depths specified.

COOL-SEASON ANNUAL GRAINS

Winter Rye (*Secale cereal*) is the most reliable cool season cover crop. Rye establishes easily, produces a lot of biomass, and suppresses weeds. It can be planted the latest in fall and is the hardiest. Rye may tie up N if not grown with a legume or if incorporated when too mature, though it may mow kill if mowed after it heads out. It is generally incorporated when it is 12-18" tall, about 2 weeks before planting the primary crop. Rye may be allelopathic, especially to small seeded crops (i.e. vegetables seeds) planted immediately after rye termination. Rye is commonly mixed with hairy vetch or red clover.

Wheat, Triticale, and Spelt (*Triticum spp.*) are hardy fall seeded cover crops that can suppress weeds and produce a moderate to high amount of biomass. Triticale is a cross between wheat and rye and spelt is an ancient subspecies of wheat. Hessian fly can be a problem with wheat and spelt harvested for grain but is generally not a problem if used solely as a cover crop. Wheat is a good nutrient catch crop and prefers well-drained, fertile soils. Spelt may perform better on poor soils. Wheat, Triticale and Spelt can also be sown in the early spring and will produce significant biomass in late spring and early summer. These three grains are commonly mixed with peas, vetch, and clover.

Barley (*Hordeum vulgare*) is one of the more difficult cereal grains to grow because it requires well drained soils with pH over 6.2. It does poorly in wet, heavy soils. It is less winter hardy than rye or wheat, and may winterkill in many regions of VT, so is best used as a spring-planted cover. Check for newer winter barley varieties for improved hardiness. When grown on lighter textured soils, barley can become deeply rooted and reduce erosion and weed biomass but is more drought tolerant than other small grains. Barley can be killed by mowing or rolling at milk stage. Barley is commonly mixed with peas, oats, and crimson or red clover.

Oats (*Avena sativa*) are commonly used in VT as a spring and fall cover. Oats establish rapidly and are easily terminated through variety of methods including tillage, herbicides, and winter termination. They provide good erosion control and tend to leave a clean seedbed. Oats will winterkill in VT and are often used by vegetable growers prior to early-planted spring crops. Fall oats must be planted earlier than winter grains, and when planted with hairy vetch the cover can provide enough soil N for sweet corn growth the following year.

WARM-SEASON ANNUAL GRAINS

Buckwheat (*Fagopyrum esculentum*) is one of the quickest growing summer annuals, and is commonly used as the smother crop, nurse crop and insectary. Buckwheat tolerates poor soils and can extract nutrients from the soil. Plants mature in 6-8 weeks, and residue degrades rapidly. If mown prior to flowering, the crop should regrow. Buckwheat should be mown or incorporated into the soil before seed set so that it does not become a weed problem.

Sudangrass, Sorghum and Sorghum-Sudangrass (*Sorghum bicolor* x *S. bicolor* var *Sudanese*), also known as Sudax, is a vigorous warm season grass that produces large amounts of biomass, increases organic matter, reduces compaction, suppresses weeds and some diseases, and can provide excellent forage and insect habitat. This grass is very responsive to nitrogen fertility although care must be taken to avoid nitrate and prussic acid poisoning that can occur during times of water stress or drought, or as a result of excessive nitrogen fertilization. These grasses are generally planted through the mid-summer for adequate growth since they will frost kill. Sudangrass has been shown to reduce nematodes and other potential pests. These grasses can be mixed with other warm season annuals such as buckwheat, forage soybeans and cowpeas.

Japanese Millet (*Echinochloa esculenta*), **Pearl Millet** (*Pennisetum glaucum*), and **Foxtail Millet** (*Setaria italica*) are drought and heat tolerant summer annuals that produce a lot of biomass quickly. These crops withstand cooler and wetter soil conditions than Sudax and are more appropriate for cooler zones of VT. Plant Japanese and Foxtail millet from early June to mid-July because later plantings may be weak due to day length response. Pearl millet is very tall and produces the most biomass. Foxtail millet should mow kill, but Japanese and Pearl millet will regrow. These millets are commonly mixed with forage soybeans and cowpeas.

Teff (*Eragrostis tef*) is a fine-leaved African grain that shows a lot of potential as a living mulch. It is very drought tolerant, can be surface broadcast, does not need much mowing, and will not go to seed. Ensure a firm seedbed prior to planting. Teff is also a quality forage that can be grazed/hayed during dry summers.

LEGUMES

Red Clover (*Trifolium pretense*) is a cool season biennial that is often used as an annual. Red clover is deep-rooted, produces a lot of N, and provides beneficial insect/pollinator habitat. It tolerates poorly drained and acidic soils. It can be interseeded with many crops, such as small grains after planting, silage corn at last cultivation, or into vegetables before harvest. Red clover does very well when frost-seeded and mixed with small grains or annual ryegrass. It is particularly well-suited for cover crop plantings that will grow for a full season.

White Clover (*Trifolium repens*) is a low growing perennial that produces moderate levels of N and tolerates traffic and close mowing/grazing. Common white clover is the lowest growing type that tolerates the most traffic and compaction. Dutch and New Zealand are intermediate, widely available types that are commonly used as living mulches. Ladino clover is the tallest white clover and produces the most nitrogen. White clover does well interseeded or frost seeded, and is often mixed with annual ryegrass, small grains, or red clover.

Alsike Clover (*Trifolium hybridum*) is an upright hybrid of red and white clover that produces more N than intermediate types and does the best in poorly drained soil. Alsike can be toxic to horses.

Yellow Sweetclover (*Melilotus officinalis*) is a highly productive biennial legume and **White Sweetclover** (*Melilotus alba*) is an annual. Sweetclover produces a lot of N and biomass, has a deep root that breaks up hardpan, and provides beneficial insect habitat. Sweetclover is better suited for well drained and droughty sites. Yellow sweetclover will mow kill after flowering in the second year. Use yellow sweetclover only if it will be grown through the second year, otherwise use annual or 'Hubam'. Sweetclover prefers spring seeding. Hard seed may remain viable in soil for years and could become weedy in some situations. This cover crop is listed as an invasive species in some other states. Sweetclover can be toxic to livestock.

Crimson Clover (*Trifolium incarnatum*) is an annual legume that will winter kill like oats. It establishes easily, produces a moderate to high amount of N and biomass, suppresses weeds, and has beautiful flowers that attract a lot of beneficial insects and pollinators. Select regionally adapted varieties for improved cold hardiness. It needs to be planted very early for adequate growth in our climate. It is easily crimped with a lasting residue. It has potential to be frost seeded, crimped, and used as mulch for late planted no-till pumpkin transplants. This clover is often mixed with annual ryegrass, small grains, and brassicas. Caution: may support nematodes that impact tomatoes.

Subterranean Clover (*Trifolium subterraneum*) is a low growing, self-seeding annual hardy to 0-15 degree F. It produces a moderate amount of N, provides beneficial insect habitat and is best used as a living mulch. It is a shade tolerant crop that tolerates wet soils, acidic soils, mowing and grazing. Subterranean clover and teff may make a great living mulch. Subterranean clover will reseed and should be mowed or killed prior to seeding if growing leafy greens or other crops where it could be a problem.

Berseem Clover (*Trifolium alexandrinum*) is a summer annual with traits like subterranean clover. It is a quick growing, heavy N producer that tends to be used as a living mulch. It establishes well with an oat nurse crop and tolerates most soils except sands. Mix with teff, ryegrass or small grains.

Hairy Vetch (*Vicia villosa*) is the most commonly used cool season legume. It is a very winter hardy winter annual, an excellent N producer, increases nutrient availability, and provides beneficial insect habitat. It is slow to establish and needs to be grown late into the spring/early summer to produce maximum N. If allowed to grow in the spring, it can provide enough N for many vegetable and late planted crops and partially replace N for corn. Smothers spring weeds. Hairy Vetch is commonly planted with winter cereals. This vetch can be killed by mowing when in full flower.

Field or Forage Pea (*Pisum sativum*) is also known as Canadian Field Pea or Austrian Winter Pea. It is a large seeded, cool-season annual that produces a large amount of nitrogen. Peas generally require support from another cover crop and should be grown with another small grain like oats. Peas make for a good companion crop if the seed is planted deep enough. Though they are cold-tolerant, peas generally winterkill in VT.

Soybean (*Glycine max*) and **Cowpea** (*Vigna unguiculata*) are warm-season annual legumes that produce a lot of N and are best grown with sorghum-sudangrass or millets. Soybean is more cold tolerant than cowpea and tends to produce more biomass and N, though it is more susceptible to pests and drought. Use regionally adapted forage varieties for maximum benefit. Cowpea requires warmer conditions than soybean, but is more tolerant of poor soils, drought, heat, and pests. Cowpea grows quickly, suppresses weeds, and provides beneficial insect habitat.

Alfalfa (*Medicago sativa*) is a perennial cool-season legume that is a superior N fixer, reduces soil compaction, and provides habitat for beneficial insects. It prefers well-drained, fertile soils near pH 7, and is best grown with a small grain nurse crop or perennial grass. Choose varieties with a fall dormancy class of 1-4. More hardy varieties (closer to class 1) tend to yield higher in the spring but mature later. Alfalfa is slow to establish so is best suited to sites where it will be allowed to grow for a full year as a green manure.

Sunn Hemp (*Crotalaria juncea*) is a warm season legume that produces significant amounts of nitrogen in 60 days depending on conditions. Its fast growth, tolerance of dry conditions, dense foliage and tall growth habit can add significant amounts of biomass in a short 6-8 week growth window, ideal for most break crop rotations. Mow, till, crimp, or use herbicide application at first flower to terminate.

BRASSICAS

Brassicas (*Brassica* spp.) include **radish**, **turnip**, **canola (rapeseed)** and **mustard**. Brassica cover crops are well-suited for scavenging residual nitrogen in the fall because they grow rapidly during periods of cool weather. Some species can alleviate soil compaction and improve soil structure. They quickly produce a large amount of biomass and can reduce erosion and suppress weeds. They can be planted in very early spring (in some sites) and terminated before flowering. This cover crop can be especially useful for planting in mid-late summer after early vegetable crops and short-season corn. Some brassicas are

used to reduce the level of soil pathogens through biofumigation; however, brassica cover crops should not be used before or after other brassica vegetable cash crops as they can cause and harbor many of the same diseases as vegetable crop brassicas such as club root. *Do not let it go to seed.*

GRASSES

Annual and Perennial Ryegrass (*Lolium* spp.) are cool season grasses with a high utility value because they establish easily when surface broadcast and can be interseeded, frost-seeded, and dormant seeded. Ryegrass produces a tremendous amount of biomass, reduces surface compaction, scavenges nutrients, and is a strong erosion fighter. Annual varieties tend to be cheaper than perennial, are used as cool and warm-season cover, and are used as living mulches. Southern varieties will winterkill, whereas regionally adapted annual varieties may overwinter in warmer areas of VT. Perennial ryegrass may be short-lived.

Table 1a - VT 340	Purpose										Other Roles & Characteristics										
Cover Crop	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	✓+	✓+	✓+				✓+	✓+	✓		✓-		✓		✓	✓	✓	✓	✓-	✓	✓
Triticale and Spelt	✓	✓+	✓				✓	✓+	✓	✓-	✓				✓+		✓	✓-			
Wheat	✓	✓+	✓				✓	✓+	✓	✓-	✓				✓+		✓	✓-		✓-	✓-
Barley	✓+	✓+	✓			✓-	✓	✓	✓	✓-	✓				✓+	✓-	✓	✓		✓-	✓
Oats	✓-	✓	✓-				✓+	✓	✓		✓-	✓-	✓-	✓+	✓+	✓-	✓+		✓-		
Warm-Season Grains																					
Buckwheat		✓-	✓+			✓+	✓+		✓					✓+	✓		✓+				✓+
Sorghum/Sudangrass	✓+	✓+	✓+			✓-	✓+	✓-	✓-	✓+	✓					✓	✓+	✓+	✓-	✓-	✓-
Japanese/Foxtail Millet	✓	✓+	✓				✓+		✓		✓+				✓		✓	✓+			✓-
Pearl Millet	✓	✓+	✓				✓+		✓		✓-						✓	✓+			✓-
Teff	✓+	✓	✓-				✓-		✓	+	✓+	✓+	✓-	✓-	✓			✓+			
Legumes																					
Red Clover	✓-	✓	✓	✓		✓+	✓-	✓	✓-	✓	✓+		✓+	✓+					✓-	✓	
White or Alsike Clover	✓	✓		✓		✓	✓	✓	✓		✓+	✓	✓	✓				✓-	✓	✓	✓+
Berseem Clover	✓	✓+	✓+	✓+	✓-			✓+	✓		✓+	✓+	✓	✓	✓		✓+	✓-	✓-	✓	
Sweetclover	✓	✓+	✓+	✓+	✓+	✓		✓	✓	✓+	✓						✓-	✓+			✓-
Crimson Clover	✓	✓		✓		✓+		✓-	✓-		✓+		✓+	✓+			✓-			✓	✓+
Subterranean Clover	✓	✓		✓	✓	✓+	✓+	✓+	✓-		✓	✓+	✓+	✓+			✓-	✓	✓-	✓	✓+
Alfalfa	✓	✓+		✓+	✓			✓		✓+	✓+										
Hairy Vetch	✓-	✓+	✓-	✓+	✓	✓	✓	✓	✓	✓-	✓-	✓-	✓	✓		✓-		✓-		✓-	✓-
Field Pea/Winter Pea	✓	✓		✓+	✓			✓	✓		✓			✓+	✓	✓	✓	✓-			

Table 1a - VT 340 (Continued)	Purpose										Other Roles & Characteristics											
Cover Crop	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!)	
Soybean	✓-	✓		✓+					✓		✓			✓+				✓				
Sunn Hemp	✓-	✓		✓+					✓		✓			✓+				✓				
Cowpea	✓+	✓	✓-	✓+	✓		✓		✓	✓-	✓-			✓			✓	✓		✓-		
Brassicas																						
Radish or Turnip	✓	✓	✓+				✓		✓-	✓+	✓-		✓	✓-			✓			✓-	✓-	
Mustard or Canola	✓	✓	✓			✓-	✓-		✓		✓-		✓	✓-	✓-	✓+	✓	✓		✓-	✓+	
Grasses																						
Annual Ryegrass	✓+	✓+	✓+				✓	✓+	✓		✓+	✓	✓+	✓+	✓+	✓-	✓		✓	✓	✓+	
Perennial Ryegrass	✓+	✓+	✓+				✓	✓+	✓		✓+	✓	✓+	✓	✓	✓-	✓		✓	✓	✓	
Orchardgrass	✓+	✓+	✓-				✓	✓+	✓		✓+		✓				✓		✓	✓-	✓	
Timothy	✓+	✓+	✓-				✓	✓+	✓		✓		✓-						✓-		✓	
Rating: Above Average (✓+); Average (✓); Below Average/Unknown (✓-). Blank = Not Recommended																						

Table 1b - VT 340	Min. Seeding Rate (lbs/acre)		Seeding Depth	Latest Seeding Dates* (USDA Hardiness Zones 3b - 5a)				Primary Purpose**			Termination Method				
Cover Crop	Broadcast (includes aerial apply)	Drilled or incorporate	Inches	Broadcast Winter Cover	Drilled or Incorporate Winter Cover	Spring Cover	Summer Cover	Erosion	Nitrogen Fixation	Nutrient Scavenge	Mow	Till	Crimp	Winter	Chemical
Cool-Season Grains															
Winter Rye	100***	75***	1 to 2	Oct 1	Oct 10	NA	NA	x		x	x	x	x		x
Winter Triticale/Wheat/Spelt	100***	75***	1 to 2	Oct 1	Oct 10	NA	NA	x		x	x	x	x		x
Spring Wheat, Triticale, Barley	100	75	1 to 2	Sept 15	Sept 15	April 15	June 1	x		x	x	x	x	x	x
Forage Oats	112	75	1 to 2	Sept 15	Sept 15	May 15	June 1	x		x	x	x	x	x	x
Warm-Season Grains															
Buckwheat	70	60	¾-1½	Aug 15	Aug 15	June 1	June 1	x		x	x	x		x	x
Sorghum/Sudangrass	50	35	¾-1½	Aug 15	Aug 15	NA	July 1	x		x	x	x		x	x
Japanese/Foxtail Millet	40	25	¾-1½	Aug 1	Aug 1	June 1	July 1	x		x	x	x		x	x
Pearl Millet	30	20	¾-½	Aug 1	Aug 1	June 1	July 1	x		x	x	x		x	x
Teff	8	5	0-¾	Aug 1	Aug 1	June 1	July 1	x		x	x	x		x	x
Legumes															
Red Clover	12	10	¾-½	Aug 31	Aug 31	April 15	May 15		x			x			x
White or Alsike Clover	10	8	¾-½	Aug 31	Aug 31	April 15	May 15		x			x			x
Berseem Clover	18	10	¾-½	Aug 31	Aug 31	April 15	May 15		x			x		x	x
Sweetclover	15	8	¾-½	Aug 31	Aug 31	April 15	May 15		x		x	x			x
Crimson Clover	25	20	¾-½	Aug 31	Aug 31	April 15	May 15		x			x	x	x	x
Subterranean Clover	25	15	¾-½	Aug 31	Aug 31	April 15	May 15		x			x			x
Alfalfa	20	15	¾-½	Aug 15	Aug 15	April 15	May 15		x			x			x
Hairy Vetch	35	20	¾-1½	Sept 15	Sept 15	April 15	May 15		x		x	x	x		x
Field Pea/Winter Pea	100	65	½-1½	Sept 1	Sept 1	April 15	May 15		x		x	x		x	x
Soybean	120	90	1 to 2	NA	NA	NA	July 15		x		x	x		x	x

Sunn Hemp	50	30	½-1	NA	NA	NA	July 15				x	x	x	x	x
Cowpea	100	60	¾-1½	NA	NA	NA	July 15		x		x	x		x	x
Brassicas															
Forage Brassica (Radish, Turnip, Winter Rapeseed)	15	10	¾-½	Sept 15	Sept 15	April 15	May 15	x		x		x		x	x
Mustard	10	6	¾-½	Sept 1	Sept 1	April 15	May 15	x		x		x		x	x
Winter Canola	10	6	¾-½	Sept 1	Sept 1	April 15	May 15	x		x		x			
Grasses															
Annual Ryegrass	30	20	0-½	Sept 1	Sept 1	April 15	May 15	x		x		x		x	x
Perennial Ryegrass	35	25	0-½	Sept 1	Sept 1	April 15	May 15	x		x		x			x

**Locations in USDA Hardiness Zone 5b may plant up to 5 days later for the Winter Cover dates.*

***Other purposes may also be accomplished, but this is meant to help you select cover crops to address the primary resource concern in the conservation plan.*

****Planting rate before Sept. 15 can be reduced to 75 lbs. for broadcast. Planting rate before Oct. 1 can be reduced to 50 lbs. for drilled or incorporated.*

Table 1c - VT 340	Min. Seeding Rate (lbs/acre)		Seeding Depth	Latest Seeding Dates* (USDA Hardiness Zones 3b - 5a)				Primary Purpose**		
Cover Crop Mixes (2-Species Mixes)	Broadcast (Includes aerial apply)	Drilled or incorporate	Inches	Broadcast Winter Cover	Drilled or incorporat e Winter Cover	Spring Cover	Summer Cover	Erosion	Nitrogen Fixation	Nutrient Scavenge
1-1										
Ryegrass-annual or perennial	20	15	¾-½	Sept 1	Sept 1	April 15	May 15	x		x
Radish/Canola/Turnip/Rapeseed	4	3								
1-2										
Winter Small Grain	85	60	½	Sept 1	Sept 1	NA	NA	x		x
Radish/Canola/Turnip/Rapeseed	4	3								
1-3										
Winter Small Grain	65	40	½	Sept 15	Sept 15	NA	NA	x		x
Forage Oat	50	40								
1-4										
Spring Small Grain	85	60	½	Sept 1	Sept 1	April 15	May 15	x		x
Radish/Canola/Turnip/Rapeseed	4	3								
1-5										
Spring Small Grain	85	60	¾	Sept 1	Sept 1	April 15	May 15	x		x
Mustard	4	3								
1-6										
Winter Small Grain	60	40	½	Aug 31	Aug 31	NA	NA	x	x	x
Red Clover	6	5								
Radish/Canola/Turnip/Rapeseed	4	2								
1-7										
Ryegrass-annual or perennial	15	12	¾-½	Aug 31	Aug 31	April 15	May 15	x	x	
Red Clover	8	6								
1-8										
Winter Small Grain	70	56	1-1½	Sept 15	Sept 15	NA	NA	x	x	
Hairy Vetch	20	15								
1-9										
Winter Small Grain	85	60	½	Aug 31	Aug 31	NA	NA	x	x	
Clover- Red, Ladino, Berseem, Crimson, Yellow, Sweet	8	6								
1-10										
Winter Small Grain	70	56	1	Sept 1	Sept 1	NA	NA	x	x	
Winter Pea	60	40								

**Locations in USDA Hardiness Zone 5b may plant up to 5 days later for the Winter Cover dates.*

***Other purposes may also be accomplished, but this is meant to help you select cover crops to address the primary resource concern.*

Table 1d - VT 340	Min. Seeding Rate (lbs/acre)		Seeding Depth	Latest Seeding Dates* (USDA Hardiness Zones 3b - 5a)				Primary Purpose**		
Cover Crop Mixes*** (3-Species Mixes)	Broadcast (Includes aerial apply)	Drilled or incorporate	Inches	Broadcast Winter Cover	Drilled or incorporate Winter Cover	Spring Cover	Summer Cover	Erosion	Nitrogen Fixation	Nutrient Scavenge
2-1: Winter Killed Mix***										
Forage Oat	40	30	1-1½	Sept 15	Sept 15	April 15	May 15	x	x	x
Field Pea	30	25								
Radish	5	3								
2-2: Marginally Winter Hardy***										
Annual Ryegrass	15	12	½-1	Sept 1	Sept 1	April 15	May 15	x	x	x
Winter Pea	30	25								
Radish	5	3								
2-3a: Winter Kill & Winter Hardy (Brassica)***										
Forage Oat	50	40	1-1½	Sept 15	Sept 15	NA	NA	x		x
Winter Rye	50	40								
Radish	5	3								
2-3b: Winter Kill & Winter Hardy (Legume)***										
Forage Oat	50	40	1-1½	Sept 15	Sept 15	NA	NA	x	x	x
Winter Rye	50	40								
Hairy Vetch	15	10								
2-4: Winter Hardy, Low Spring Biomass***										
Winter Rye	50	40	1-1½	Sept 15	Sept 15	NA	NA	x	x	x
Winter Pea	30	25								
Turnip	5	3								
2-5: Winter Hardy, Moderate Biomass***										
Winter Rye	50	40	½-1½	Aug 31	Aug 31	NA	NA	x	x	x
Crimson Clover	12	10								
Red Clover	5	3								
2-6: Winter Hardy, High Spring Biomass***										
Winter Rye	100	75	½-1½	Sept 15	Sept 15	NA	NA	x	x	x
Hairy Vetch	15	10								
Winter Rapeseed	5	3								

*Locations in USDA Hardiness Zone 5b may plant up to 5 days later for the Winter Cover dates.

**Other purposes may also be accomplished, but this is meant to help you select cover crops to address the primary resource concern.

***To substitute species in a mix listed above, or create your own mix, use seeding rates in Table 1e (only to be used in mixes that contain three different species).

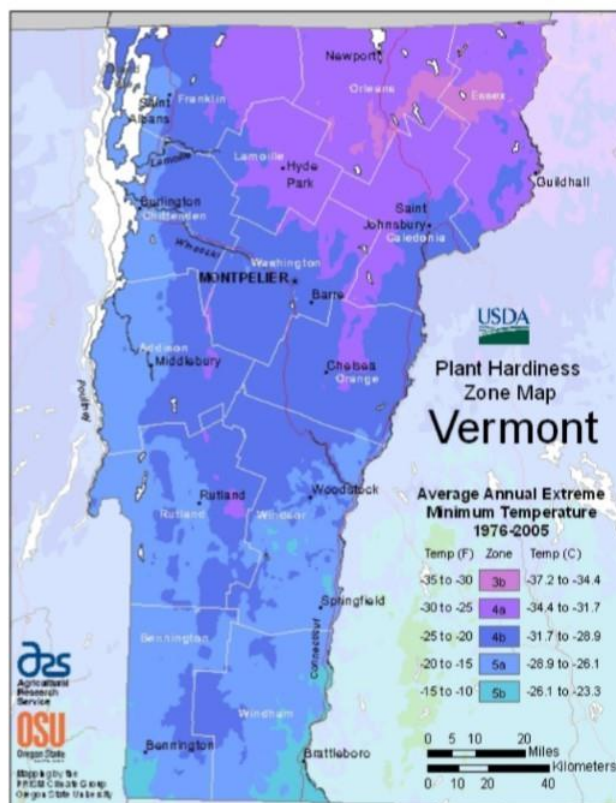
Table 1e - VT 340	Seeding Rate (in a three-way mix) (lbs/acre)	
	Broadcast (Includes aerial apply)	Drilled or incorporated
Grasses & Grains		
Winter Rye	50	40
Winter Wheat	50	40
Winter Triticale	50	40
Spring Grain	50	40
Forage Oats	50	40
Annual Ryegrass	15	12
Legumes		
Red/White Clover	8	6
Crimson Clover	12	10
Berseem/Sweet Clover	10	8
Field Pea	30	25
Winter Pea	30	25
Hairy Vetch	15	10
Brassicas		
Radish	5	3
Turnip	5	3
Rapeseed	5	3

Seeding rates are in pure live seed (PLS):
 $\% \text{ PLS} = \% \text{ germination} \times \% \text{ pure seed} / 100$

To determine actual seeding rate, divide desired PLS seeding rate by your seeds' % PLS

Example: To achieve a 50 lbs/acre PLS seeding rate with seed that has 85% PLS.
 $50 \div 0.85 \text{ PLS} = 59 \text{ lbs/acre actual seed.}$

Figure 1



Specific Site Requirements