

327 CONSERVATION COVER SPECIFICATIONS

Permanent, perennial vegetative cover should be established during the first recommended seeding or planting period for the selected species within the first year of the land use conversion. If this is not possible, a temporary cover may be used and the permanent vegetative cover must be established during the next seeding period

Criteria for Establishment of Upland Cover - Permanent Vegetative Cover Establishment - Grasses, Legumes, Forbs:

Native and introduced grass, legume and forb mixtures beneficial to upland wildlife are listed in Tables 1-2. Native plants and plant communities are encouraged since they are well-adapted to sites, less invasive, and likely to provide quality habitat without costly long term maintenance. However, due to cost, availability and landscape position, native plants may not be feasible in all situations. Seeding rates shall be based on Pure Live Seed (PLS), where PLS = % germination (+ dormant seed) x % purity.

1. Establish Native Grasses, Forbs and Legumes:

- Mixtures will comprise a minimum of 5 native species consisting of at least 3 native grasses and at least 1 native forb/legume.
- Total recommended grass seeding rate is 8-12 lb/ac PLS, resulting in at least 30-40 seeds/sq ft. Grasses shall not exceed 90% of the mixture based on seeds/sq. ft.
- No more than 20% of the grass component will be comprised of cool season grass species based on seeds/sq ft.
- Total recommended forb/legume seeding rate is 4.0-8.0 oz/ac PLS, resulting in a minimum 2-4 seeds/sq ft. When multiple forb/legumes are included in a seed mixture, no individual specie should comprise more than 50% of the mixture based on seeds/sq. ft.
- Solid stands of Switchgrass are allowed for the specific purpose of providing winter cover in landscapes lacking adequate emergent wetlands or woody vegetation. See Table 1 for seeding rate.
- Refer to “Biology Job Sheet #9 – “Establishment of Native Grass and Forbs” for additional specifications.

2. Establish Introduced Grasses and Legumes:

- Mixtures will comprise a minimum of 4 species consisting of at least 3 grasses and at least 1 forb/legume.
- Total recommended grass seeding rate is a minimum 30-40 seeds/sq ft.
- At least 50% of the mixture shall be comprised of grasses based on seeds/sq ft.
- Introduced grass/legume mixtures may include up to 20% Switchgrass and/or Western Wheatgrass.
- The use of introduced species should be avoided adjacent to existing native prairie or other sensitive areas.
- Refer to Biology Job Sheet #8: “Establishment of Introduced Grasses and Legumes” for fertilizer and establishment recommendations.

Recommended Plant Species

Select combinations of plant species and cultivars best adapted to site conditions. Acceptable varieties of introduced grasses and legumes shall be selected from those listed in the most current University of Minnesota Varietal Trials publication. To insure longer life, alfalfa varieties shall have a Winter Survival Index of less than three, listed in the Very Good Winter Survival category. Varieties with no Winter Survival Index shall have a third year yield of at least 105% of check varieties.

Approved varieties of native grasses are listed in Table 3. Where there are known native prairies or certified native grass or forb seed production fields present, maintain an isolation distance of 165 feet for grasses and 1320 feet for forbs when planting the same species that have different genetic origins.

Seedbed Preparation and Seeding

Prepare a firm seedbed for all planting methods.

Conventional Tillage - Prepare a fine firm seedbed to a minimum of 3 inches. The seedbed should contain enough fine soil particles for uniform shallow coverage of the seed as well as contact with moisture and nutrients. If possible, use specialized native grass drills with depth bands designed to handle a wide variety of seed. For conventional drills, as a minimum, cultipack before seeding, cultipack after seeding if possible.

Do not use heavy drills on conventionally prepared seedbeds as heavy drills tend to sink in the soil and depth control is difficult. Plant seed between one-quarter and one-half inch deep. Some seed may be seen on the surface of the ground after seeding. Tillage should only be used on flatter slopes or in conjunction with erosion control measures.

No-Till - No-till drilling reduces the exposure of the newly seeded site to erosion. A no-till drill must be used to seed these sites. A drill should be selected that can handle a wide variety of seed (fluffy, smooth, large, and small) and low seeding rates. Plant seed between one-quarter and one-half inch deep.

Use of a herbicide is essential in order to kill existing vegetation. Land that has been in grass for many years usually has a thick residue layer on the soil surface. To allow for the best no-till seedbed this residue must be removed. Three options are: (1) grazing; (2) mowing with residue removed; and (3) prescribed burn. In the fall a burndown herbicide can be applied to prepare for a spring no-till seeding. An additional spring herbicide application may be required, depending on plant growth.

Broadcast - Prepare a fine firm seedbed to a minimum of 3 inches. Use a roller, cultipacker or similar implement prior to seeding. The seedbed should contain enough fine soil particles for uniform shallow coverage of the seed as well as contact with moisture and nutrients. Broadcast seed at a rate of 1.5 times the normal seeding rate and roll or cultipack again after seeding. Do not harrow in the seed.

Seeding Dates

Seeding dates are listed in Table 4. Seeding of warm season grasses may begin before May 15th when the soil temperature is established at 50° F or higher. When mixtures containing both warm season native and cool season introduced grasses are to be planted, select the seeding date based on the predominant plants in the mixture.

These are based on long term averages and may be extended by two weeks by the state agronomist. Extension of these deadlines shall be based on both favorable moisture and temperature for seed germination.

Seed Quality

All seed shall be of high quality and be labeled in accordance with Minnesota Seed Law. For information about this law, see Minnesota Agronomy Tech Note MN-9. Seed tests must show the percentage of germination and percentage of purity.

Inoculate legume seed before seeding with the inoculants specific for the species. Pre-inoculated seed may be used but shall be re-inoculated if used beyond dates specified on the seed tag. This does not apply to native legumes.

Native Seed Origin

- Native grass seed origin shall be within a 200 mile radius of the project site, unless otherwise identified as an acceptable cultivar.
- Forbs and legumes with origins native to Minnesota are preferred. When local Minnesota seed sources are not available, native forbs and legume seed shall originate from Wisconsin, northern Nebraska, North Dakota, South Dakota, northern Iowa, and the Canadian provinces of southern Manitoba and Ontario.
- If the true origin of the seed can be certified as one of the accepted states or provinces, then there would be no restriction on where the seed is grown. Certification must be provided by the grower, and responsibility for obtaining certification rests with the producer.
- The use of cultivars should be avoided adjacent to existing native prairie or other sensitive areas. "Yellow Tag" or source identified materials would be preferred.

Companion Crops

For spring seedings of cool season species, a companion crop shall be used for erosion control and weed suppression. No companion crop is required for inter-seeding or for late summer seeding, but may be desirable for erosion control and to protect developing seedlings. Companion crop seeding rates shall be: Oats: ¾ to 1¼ bushels/acre; Barley: ½ to 1 bushel/acre; Winter Wheat: ½ bushel/acre (**spring seeding only**).

Companion crops are generally not recommended for warm season seedings. On highly erodible sites it may be desirable unless you are no-tilling into 70% residue cover or standing small grain stubble. Use a seeding of oats at ¾ to 1¼ bushels/acre. *Canada wildrye or Sideoats grama may also be considered as companion crops when included in the seeding mixture.*

Companion crops shall be clipped after jointing but before heading unless otherwise directed by the technical agency. Second and subsequent clippings are necessary when re-growth provides competition. Clipping height should be above developing seedlings. Where excessive growth has accumulated, the vegetation should be chopped and dispersed rather than swathed. Companion crops seeded with late summer cool season grass seedings do not require clipping.

Temporary Cover Establishment

The temporary cover crops and seeding rates are listed in Table 5.

Where chemical residue carryover is the cause of delayed planting, refer to the product label for crops to rotate to. A bioassay test may be used to better determine chemical carryover.

Small grain temporary cover crops shall be clipped in the boot stage in order to prevent seed formation. Spring seeded winter wheat and spring seeded winter rye will not require clipping. Millet and sorghums need to be clipped in the early heading stage to prevent viable seed formation. Forage sorghums, sudangrass and sorghum-sudangrass may need multiple clippings to control biomass accumulation and seed production.

Residue from the temporary cover may be fall tilled, leaving a minimum of 40% residue cover.

Weed Control

Approved Herbicides may be used on both introduced and native plantings to control weed species.

During the establishment year, mow weeds after they have reached a 12" height. Mow 2–3 times, generally on 30 day intervals from the date of seeding. Mow to a height of 6" to 8". Use a rotary mower or remove the clippings so as not to smother the seedlings. This will slow the weeds but won't harm the prairie plants.

The second year, evaluate the stand to determine if weed control is necessary. If it is, spot mow the planting at a height of six inches. If there is enough material for a prescribed burn, this may be an effective method to control weeds.

Fertilizer and Lime Requirements

For introduced grasses and legumes, fertilizer will be applied according to a soil test from the year of seeding, or from the two preceding calendar years. The rate of application of commercial fertilizer will be done according to Minnesota Extension Service recommendations. The rate applied shall be 100% of the recommended rate per acre of each nutrient for a 2 ton yield goal. Nitrogen is not recommended when legumes are part of the mixture.

Soil test requirements for phosphate and potash may be waived when the soil test is in the medium range. Apply the recommended rate per acre of liming materials to raise the soil pH to 6.5 for alfalfa or 6.0 for other legume species. Liming materials shall be applied and incorporated prior to seeding. Liming materials normally contain enough fines to permit application at seeding time and still obtain an adequate stand of legumes. Fertilizer and lime are not required for warm season grasses. However, if previous soil test history, current soil test results or the soils inherent fertility is low in phosphorus; apply 50 lbs P₂O₅ per acre prior to seeding.

Operation and Maintenance

- Mow, clip or use approved herbicides as often as necessary to control noxious weeds and undesirable plants during the establishment period. Manage plantings to reduce competition of companion crops or undesired vegetation.
- After the establishment period, use spot mowing or spot herbicide treatment to control noxious weeds and other undesirable plant growth. Annual mowing of the whole field will not be permitted unless recommended by a technical agency.
- Mowing after the seeding year (except for noxious weed control) should be done between August 1- September 1 to protect nesting wildlife, with approval by a technical agency.
- Re-seed areas where stands fail to provide adequate ground cover.
- Where plant vigor declines in introduced grass and legume plantings, maintenance levels of plant nutrients may be necessary. Refer to Nutrient Management (590), for recommendations.
- Where plant vigor declines in native plant species or where invader species threaten native mix stands, burning or light disking may be appropriate. See Prescribed Burning (338), for information on burning criteria.

- Occasional grazing and/or haying may benefit the stand. If grazing is to be used, develop a planned grazing system and follow management recommendations outlined in the Prescribed Grazing (528). Develop management criteria for haying based on the Forage Harvest management (511).

Table 1. RECOMMENDED SEEDING MIXTURES FOR INTRODUCED GRASSES AND LEGUMES

Seeding rates are listed in pounds pure live seed per acre. All seeds shall be tested by a qualified laboratory and labeled for sale in Minnesota as prescribed by the Minnesota Department of Agriculture.

Species	% of Mix By Seeds/Sq Ft	Full Seeding Rate PLS	Seeds/Sq Ft	pH Range	Wet Soils ¹	Drought Tolerance ²	Flood Tolerance	Invasive-ness ³
Orchardgrass	0-25	8.0	15.0	6.2 - 7.5	Yes	Fair	Poor	Low
Timothy	0-25	4.0	28.2	5.5 - 7.5	Yes	Poor	Good	Low
Intermediate Wheatgrass	0-50	24.0	2.0	6.5 - 8.5	No	Fair	Fair	Low
Tall Wheatgrass	0-50	24.0	1.8	6.5 - 8.5	Yes	Poor	Good	Low
Western Wheatgrass ⁴	0-10	16.0	2.5	6.5 - 8.5	Yes	Good	Good	Low
Switchgrass ⁴	0-10	6.0	8.9	5.0 - 7.5	Yes	Fair	Good	Low
Alfalfa	0-50	12.0	4.6	6.2 - 7.5	No	Good	Poor	Low
Red Clover	0-25	9.0	6.3	5.5 - 7.5	Yes	Fair	Fair	Low
White Clover	0-25	3.0	18.3	5.0 - 7.0	Yes	Poor	Good	Low
Alsike Clover	0-25	2.0	16.0	4.0 - 7.5	Yes	Poor	Good	Low

¹Wet soils are those classified as somewhat poorly drained to poorly drained.

²Droughty soils are those classified as excessively drained.

³Refers to the potential for a species to spread into adjoining areas.

⁴Switchgrass and/or Western Wheatgrass may be included in introduced grass-legume mixtures.

Example: A dense nesting cover mixture of Tall Wheatgrass, Int. Wheatgrass, Timothy, Alfalfa and Clover.

SPECIES	POUNDS/ACRE - PLS	SEEDS/Sq Ft	% OF COMPONENT by SEEDS/Sq Ft	% OF MIXTURE by SEEDS/Sq Ft
Tall Wheatgrass	7.75	14.0	39.9	65% Grasses
Intermediate Wheatgrass	7.0	14.0	40.0	
Timothy	0.25	7.1	20.1	
	15.0	35.1	100	
Alfalfa	2.0	9.5	50	35% Legume
Red clover	0.75	4.7	25	
White Clover	0.25	4.6	25	
	3.0	18.8	100	

Table 2. RECOMMENDED SEEDING MIXTURES FOR NATIVE GRASSES, FORBS AND LEGUMES

Seeding rates are listed in pounds pure live seed per acre. All seeds shall be tested by a qualified laboratory and labeled for sale in Minnesota as prescribed by the Minnesota Department of Agriculture.

GRASSES

Species	% of Mix by Seeds/Sq Ft	Full Seeding Rate (PLS)	Seeds/ Sq Ft (1 lb/ac)	pH Min.	Wet Soils ¹	Drought Tolerance ²	Flood Tolerance
Big Bluestem (<i>Andropogon gerardii</i>)	0-50	8.0	3.8	>5.5	Yes	Moderate	Good
Indiangrass (<i>Sorghastrum nutans</i>)	0-50	8.0	4.0	>5.5	No	Moderate	Moderate
*Green Needlegrass (<i>Stipa viridula</i>)	0-10	8.0	4.0	>5.5	No	Moderate	Fair
Little Bluestem (<i>Schizachyrium scoparium</i>)	0-30	8.0	6.0	>5.5	No	Good	Poor
Sideoats Grama (<i>Bouteloua curtipendula</i>)	0-30	8.0	4.4	>5.5	No	Good	Poor
Prairie Sandreed (<i>Calamovilfa longifolia</i>)	0-30	5.0	6.6	>5.5	No	Excellent	Poor
*Canada Wildrye (<i>Elymus canadensis</i>)	0-10	12.0	2.6	>5.5	Yes	Moderate	Moderate
*Slender Wheatgrass (<i>Agropyron caninum</i>)	0-10	8.0	3.7	>5.0	Yes	Moderate	Moderate
*Western Wheatgrass (<i>Agropyron smithii</i>)	0-10	12.0	2.6	>6.5	Yes	Good	Good
Blue Grama (<i>Bouteloua gracilis</i>)	0-20	2.0	17.5	>5.5	No	Excellent	Poor
Switchgrass (<i>Panicum virgatum</i>)	0-100 ³	5.0	9.0	>5.5	Yes	Poor	Good
*Canada Bluejoint (<i>Calamagrostis canadensis</i>)	0-5	10.0	91.0	>5.5	Yes	Poor	Excellent
Prairie Cordgrass (<i>Spartina pectinata</i>)	0-5	8.0	3.8	>5.5	Yes	Fair	Excellent
*Virginia Wildrye (<i>Elymus virginicus</i>)	0-10	15.0	2.2	>5.0	Yes	Moderate	Good
*Kalms Brome (<i>Bromus kalmii</i>)	0-10	8.0	3.0	>5.5	No	Moderate	Fair

*Cool Season Grasses

¹Wet soils are those classified as somewhat poorly drained to very poorly drained.

²Droughty soils are those classified as excessively drained.

³Up to 10% allowed in mixtures.

Example: A native grass/forb nesting cover mixture.

SPECIES	PLS/ACRE	SEEDS/Sq Ft	% OF COMPONENT MIX - SEEDS/Sq Ft	% OF TOTAL MIX - SEEDS/Sq Ft
Big Bluestem	3.5 lb	13.3	38.8	90% Grasses
Indiangrass	3.3 lb	13.2	38.5	
Little Bluestem	1.0 lb	6.0	17.5	
Switchgrass	0.2 lb	1.8	5.2	
	8.0 lb	34.3	100	
Black-eyed Susan	0.8 oz	1.7	50	10% Forbs
Purple Prairie Clover	4.2 oz	1.7	50	
	5.0 oz	3.4	100	

Table 2 (con't). FORBS AND LEGUMES

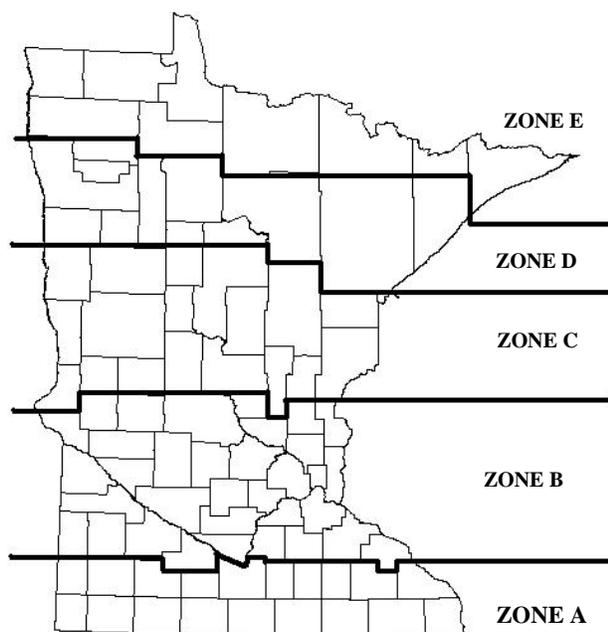
The following list identifies native forbs and wildflowers beneficial to upland wildlife and native habitat restoration. The list is not inclusive, and identifies those species, which are readily available through private vendor seed supplies. Forbs and legumes with origins native to Minnesota are preferred. When local Minnesota seed sources are not available, native forbs and legume seed shall originate from Wisconsin, northern Nebraska, North Dakota, South Dakota, northern Iowa, and the Canadian provinces of southern Manitoba and Ontario. If the true origin of the seed can be certified as one of the accepted states or provinces, then there would be no restriction on where the seed is grown. Certification must be provided by the grower, and responsibility for obtaining certification rests with the producer.

Species		Value to Wildlife	Seeding Rate PLS Oz/Acre	Seeds/Sq Ft ¹
DRY				
Bush Clover	(Lespedeza capitata)	G	1.0	0.18
Dotted Blazingstar	(Liatris punctata)	EX	1.0	0.16
Purple Coneflower	(Echinacea angustifolia)	EX	2.0	0.32
Prairie Cinquefoil	(Potentilla arguta)	G	0.5	2.64
Showy Penstemon	(Penstemon grandifloris)	G	1.0	0.32
Silky Aster	(Aster sericeus)	EX	1.0	0.60
DRY to MESIC				
Butterfly Weed	(Asclepias tuberosa)	EX	2.0	0.20
Compass Plant	(Silphum laciniatum)	G	2.0	0.02
Hoary Vervain	(Verbena stricta)	G	1.0	0.64
Leadplant	(Amorpha canescens)	EX	1.0	0.37
Prairie Smoke	(Geum triflorum)	G	1.0	0.62
Rough Blazingstar	(Liatris aspera)	EX	1.0	0.37
Showy Goldenrod	(Solidago speciosa)	G	1.0	2.18
Smooth Aster	(Aster laevis)	EX	1.0	1.26
Stiff Tickseed	(Coreopsis palmata)	EX	1.0	0.23
Thimbleweed	(Anemone cylindrical)	G	1.0	0.60
MESIC to WET				
Canada Tick Trefoil	(Desmodium canadense)	G	3.0	0.30
Common Ox-eye	(Heliopsis helianthoides)	EX	2.0	0.28
Giant Sunflower	(Helianthus giganteus)	EX	1.0	0.23
Golden Alexanders	(Zizia aurea)	G	1.0	0.25
Ironweed	(Veronica fasticulata)	G	1.0	0.55
Partridge Pea	(Chamaecrista fasticulata)	EX	5.0	0.30
Rattlesnake Master	(Eryngium yuccifolium)	EX	2.0	0.34
Tall Blazingstar	(Liatris pycnostachya)	EX	1.0	0.25
Wild Bergamot	(Monarda fistulosa)	EX	1.0	1.61
Yellow Coneflower	(Ratibida pinnata)	EX	1.0	0.69
WET				
Blue Vervain	(Verbena hastata)	G	1.0	2.13
Boneset	(Eupatorium perfoliatum)	EX	0.5	1.84
Joe-pye Weed	(Eupatorium maculatum)	G	1.0	2.18
New England Aster	(Aster novae-angliae)	G	1.0	1.52
Panicled Aster	(Aster lanceolatus)	EX	0.5	1.79
Swamp Milkweed	(Asclepias incarnata)	EX	2.0	0.2
DRY to WET				
Black-eyed Susan	(Rudbeckia hirta)	EX	1.0	2.11
Illinois Bundleflower	(Desmanthus illinoensis)	G	4.0	0.40
Purple Prairie Clover	(Dalea purpurea)	EX	1.0	0.41
Maximillian Sunflower	(Helianthus maximiliani)	EX	1.0	0.30
Stiff Goldenrod	(Solidago rigida)	EX	1.0	0.94
White Prairie Clover	(Petalostemum candidum)	EX	1.0	0.44
Yarrow	(Achillea millefolium)	EX	0.5	2.10

¹Seeds/sq ft based on recommended seeding rate

Table 3. NATIVE GRASS - RECOMMENDED VARIETIES

SPECIES	VARIETY	ADAPTABILITY ZONE RATINGS ¹				
		A	B	C	D	E
Switchgrass	Forestburg	1	1	1	2	3
	Sunburst	1	1	1	2	3
	Nebraska 28	1	1	2	3	4
	Summer	1	2	3	4	4
	Dacotah	3	2	1	1	1
	Pathfinder	1	2	3	4	4
Big Bluestem	Bonilla	1	1	1	2	3
	Champ	1	1	2	3	4
	Rountree	1	2	3	4	4
	Pawnee	1	2	3	4	4
	Bison	3	2	1	1	1
	Sunnyview	1	1	1	2	3
Indiangrass	Holt	1	1	2	3	4
	Oto	2	3	4	4	4
	Tomahawk	2	1	1	1	1
Sideoats Grama	Pierre	1	1	1	2	3
	Butte	1	1	2	3	4
	Trailway	1	2	3	4	4
	Killdeer	3	2	1	1	1
Little Bluestem	Itasca	1	1	1	1	1
	Badlands	2	1	1	1	1
	Camper	2	3	3	4	4
	Blaze	2	3	4	4	4
Prairie Sandreed	Goshen	1	1	2	4	4
Green Needlegrass	Lordorm	Statewide				
	MN, ND and SD Common	Statewide				
Blue Grama	Bad River ecotype	Statewide				
	ND or SD Common	Statewide				
Western Wheatgrass	Rodan, Rosana and Flintlock	Statewide				
Slender Wheatgrass	Revenue, Adanac	Statewide				
Canada Wildrye	Mandan	Statewide				
Prairie Cordgrass	Red River	Statewide				

**¹Adaptability Zone Ratings:**

- 1) Adapted with optimum performance;
- 2) Moderately adapted under haying or grazing; may not always produce mature seed;
- 3) Poorly adapted;
- 4) Not adapted.

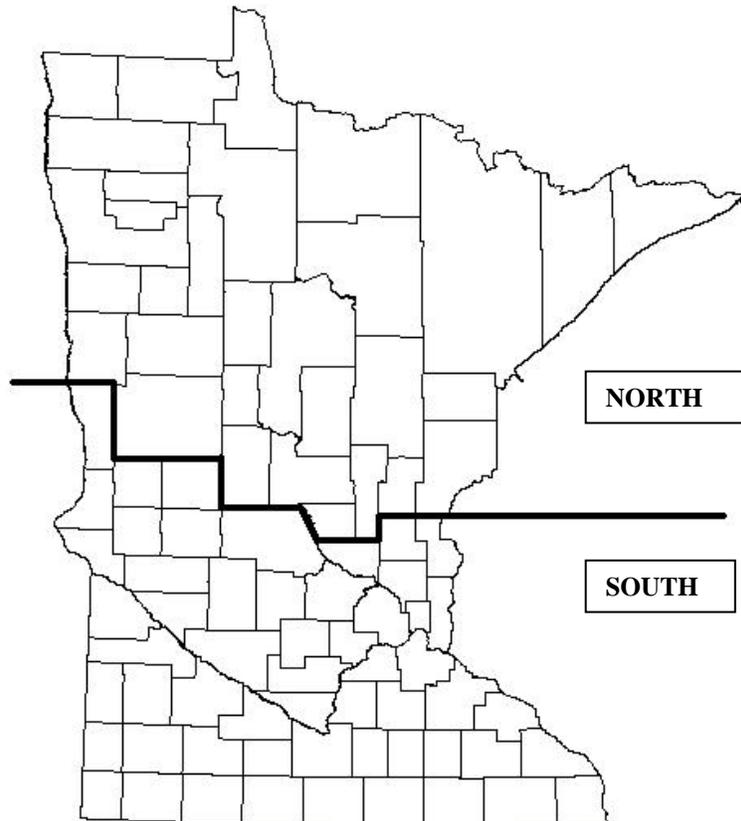
Table 4. SEEDING DATES

Cool Season Grasses & Legumes

	Spring	Late Summer	Dormant
North	4/1-6/15	7/15-9/1	11/1-freeze up
South	4/1-6/1	8/1-9/10	11/1-freeze up

Warm Season Grasses, Forbs and Legumes (includes warm and cool season natives when planted in a mixture)

	Spring	Late Summer	Dormant
Statewide	5/15-6/30	Not recommended	11/1-freeze up

**Table 5. TEMPORARY COVER CROPS**

Cover Crop	Seeding Rate/Acre	Seeding Dates - Statewide
Oats	2.5 bu.	April 1 to June 1, August 1 to Sept. 1
Barley	1.5 bu.	April 1 to June 1 August 1 to Sept. 1
Spring or Winter Wheat	1.25 bu.	April 1 to June 1
Spring or Winter Rye	1.0 bu.	April 1 to June 1
Annual Ryegrass	8.0 lbs.	April 1 to June 1 August 1 to Sept. 1
Proso Millet	12.0 lbs.	May 15 to June 10
Sorghum/Sudangrass	12.0 lbs.	May 15 to June 10
Grain Sorghum	10.0 lbs.	May 15 to June 10
Corn	140,000 seeds	May 15 to June 10