THE CITY OF CROOKSTON

124 N BROADWAY
CROOKSTON, MN 56716
218-281-4503

Sealed Bids for the City of Crookston Topsoil and Hydroseeding Placement.

The City of Crookston is requesting bids for hydroseeding in accordance with MNDOT seeding manual for areas damaged during the spring of 2022 high-water event. Areas identified as needing topsoil require a minimum of 3 inches of topsoil. Contractor must apply MNDOT Seed mix 25-151 at a rate of 120 pounds/acre. Areas that will be hydroseeded without topsoil placement will need to be Harley raked and leveled prior to seeding. See attached MNDOT Spec. for more information. See images for specific location identification.

Areas requiring topsoil and hydroseeding.
(#1) Fire Hall- 5,813 sq yards

Areas requiring hydroseeding
(#1) Old HWY 75- 1381 Sq. yards
(#2) Summit Ave.- 503 sq. yards
(#2) Riverside- 417 Sq. yards
(#3) S. Ash & Houston- 184 Sq. yards
(#4) Library- 1137 Sq. Yards

Approx. Hydroseeding total 9435 sq. yards

Approx. 485 cubic yards of topsoil required

The City of Crookston has outlined requirements that the bids must be sealed and labeled as City of Crookston Topsoil and Hydroseeding Placement. The bids are due by 2:00 p.m. on Thursday, October 6, 2022, to be delivered to the City Hall Clerk's Office at 124 N Broadway, Crookston MN 56716. Interested parties may pick up a proposal packet at the City Clerk's office, City Hall or available on www.crookston.mn.us. The City has the right to reject any and all bids.


#1
Red Lake River
S Main St
Prairie Smoke Wellness & Spa
E Loring St
Calvary Conservativ Baptist Church
Houston Ave
Stenshoel-Houske Funeral & Cremation...
Wildflower Garden
Crookston Fire Department
Sampson St
Central Ave S
Red Lake River
Bessie St
S Ash St
Holly Ave
Hurlbut St
Myrtle St
Franklin Park
Leonard Ave
S Hubbard St
S Front St
Spendley St
Google
Imagery ©2022 Maxar Technologies, USDA/FPAC/GEO, Map data ©2022
United States
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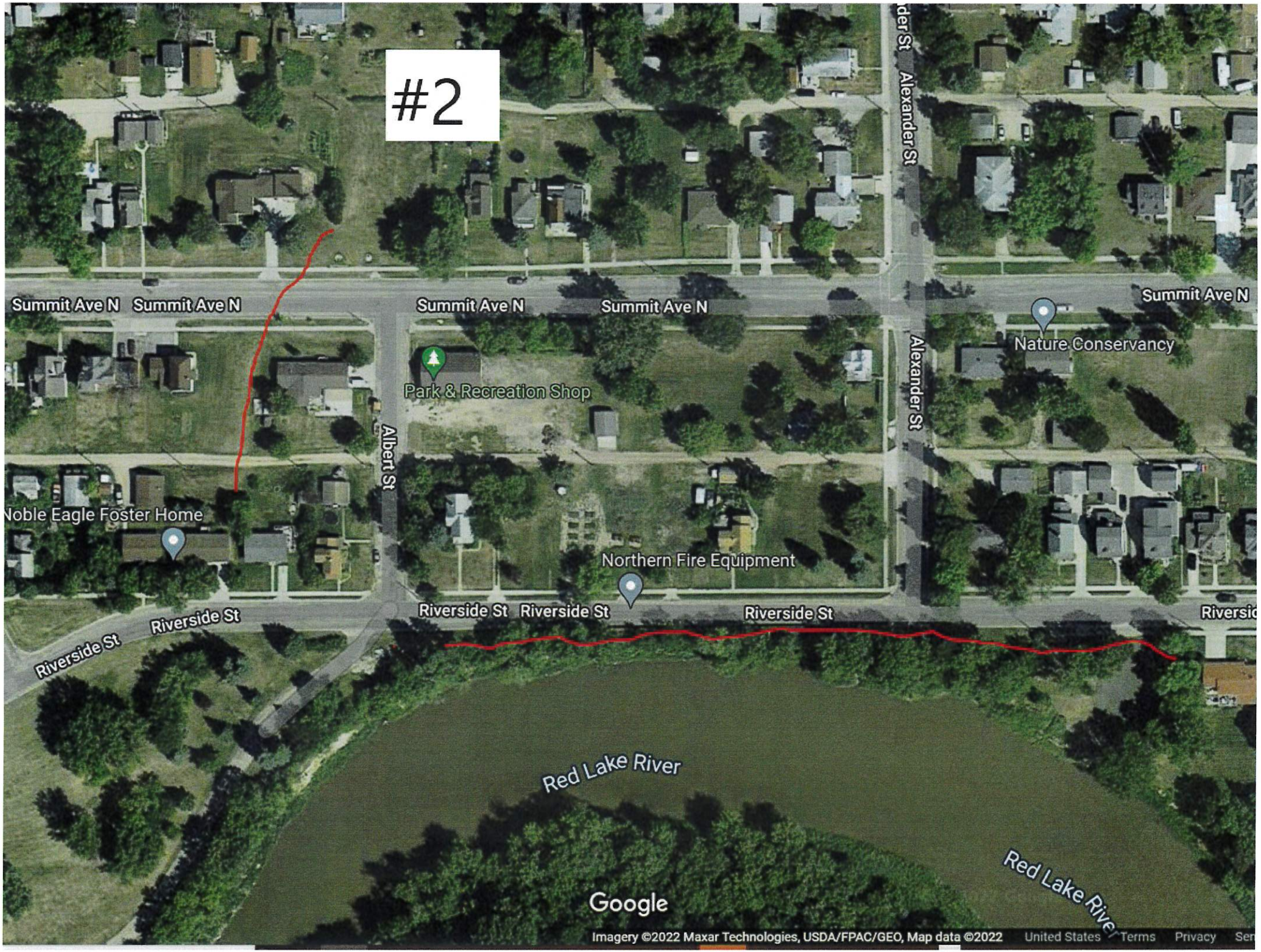
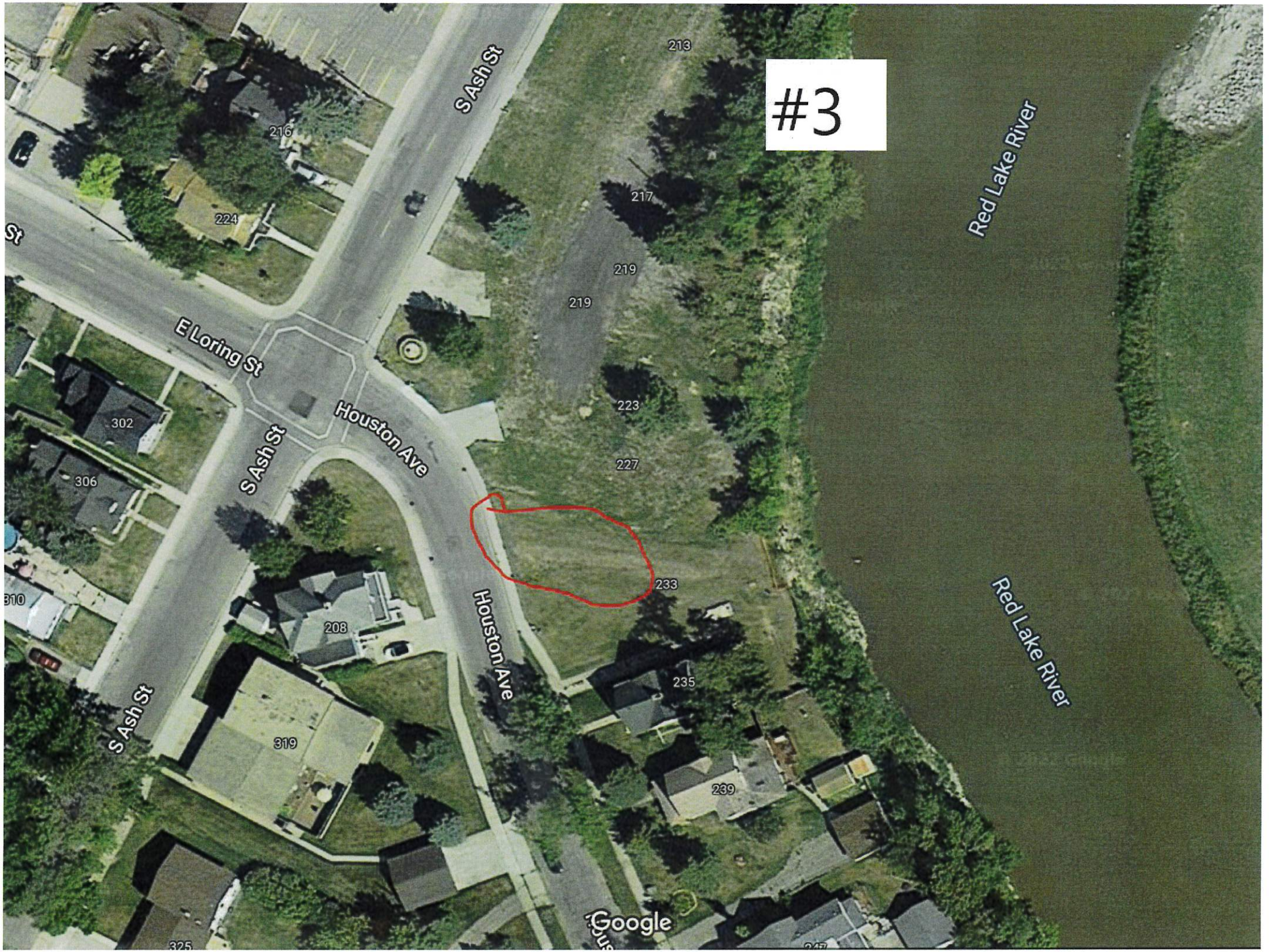
Privacy


#2
Summit Ave N
Summit Ave N
Summit Ave N
Summit Ave N
Summit Ave N
Alexander St
Alexander St
Nature Conservancy
Park & Recreation Shop
Albert St
Noble Eagle Foster Home
Northern Fire Equipment
Riverside St
Riverside St
Riverside St
Riverside St
Riverside St
Red Lake River
Red Lake River
Google
Imagery ©2022 Maxar Technologies, USDA/FPAC/GEO, Map data ©2022
United States
Terms
Privacy


#3
S Ash St
E Loring St
Houston Ave
Red Lake River
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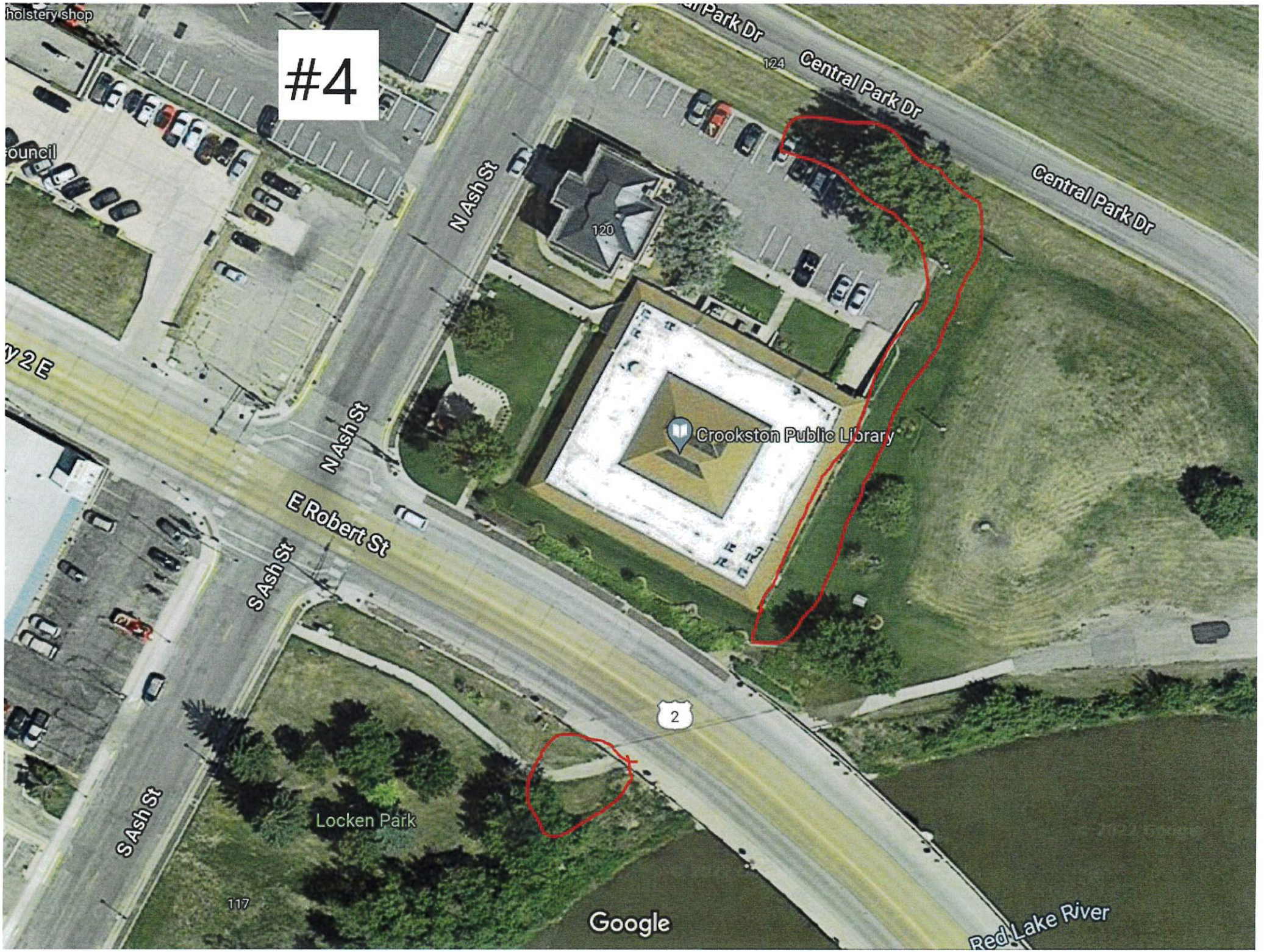
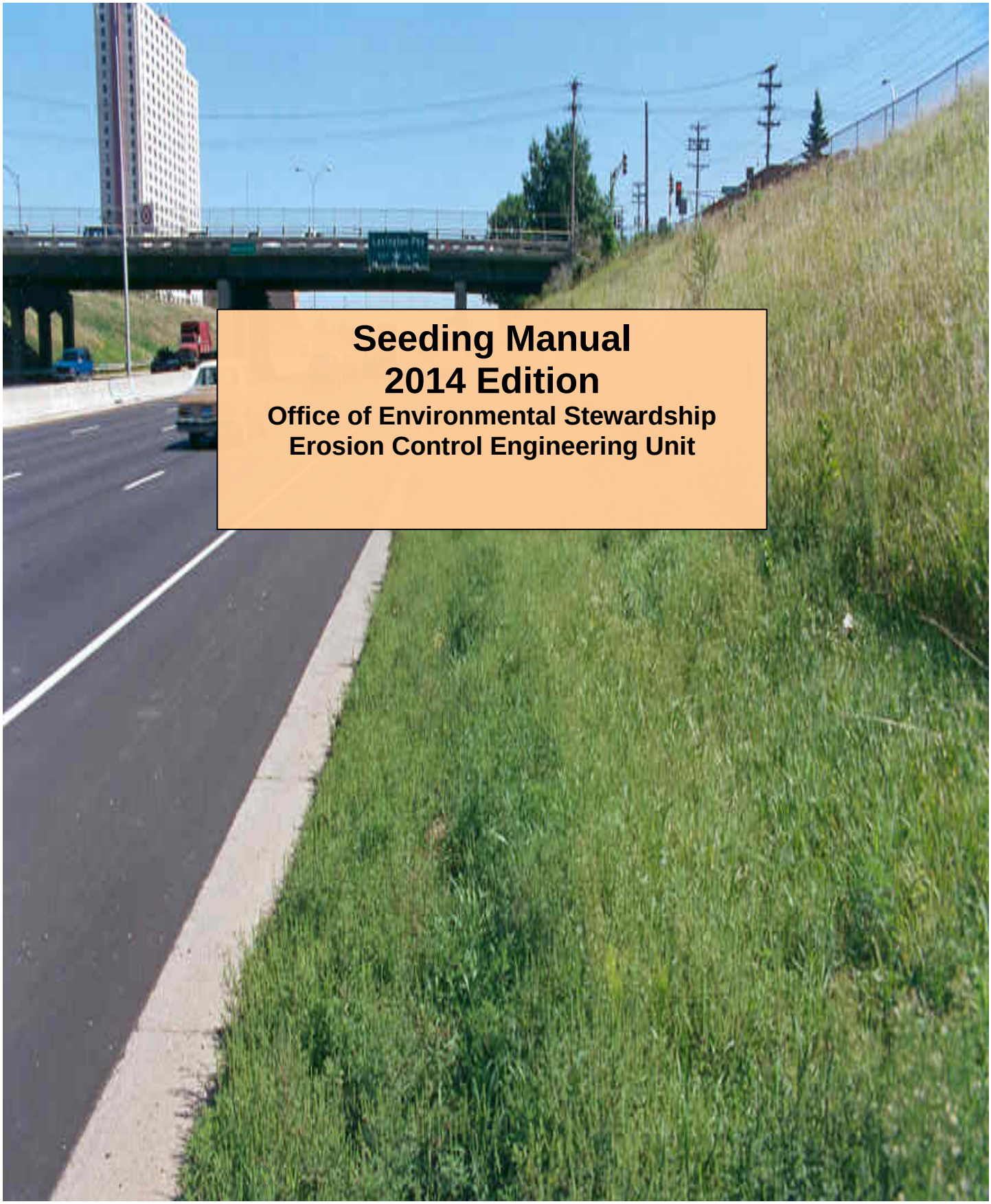
208
319
325
Google


#4
Central Park Dr
Central Park Dr
124
120
N Ash St
N Ash St
Crookston Public Library
E Robert St
S Ash St
S Ash St
Locken Park
117
2
Red Lake River
Google



Seeding Manual
2014 Edition

Office of Environmental Stewardship
Erosion Control Engineering Unit

Mn/DOT Seeding Manual

The seeding manual entails methods used to establish and maintain both general and native seed mixtures for roadside plantings throughout the state of Minnesota. The manual provides a basic guide to the seed mixtures that Mn/DOT typically specifies and the methods for placement. For detailed seeding and mulch recommendations, refer to the individual Mn/DOT district seeding recommendations.

Seed Mixtures

The seed mixtures described in Mn/DOT's Standard Specifications for Construction 2014 Edition will be specified and used on construction projects Seed Mixtures from the 1995, 2000, and 2005 editions of the Standard Specifications for Construction should no longer be specified.

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Basic Seed Mixture Design Information

The following recommendations are intended to provide general guidance for the areas in which mixtures listed should be used. Note that within each mixture tabulation, at the end of this manual, there is a brief description of the mix and what it was developed for.

The seeding rates listed are for roadside establishment and initial erosion control. The rates are somewhat higher than rates used for seeding parkland fields and other non-roadside areas.

General Seed Mixture Overview

Table 1
Recommended Seed Mixtures

	Purpose	Mixture	Seeding Rate (lbs/acre)	Maintenance
Temporary	Fall Cover	21-112	100	N/A
	Spring/Summer Cover	21-111	100	N/A
	Soil-building Cover	21-113	110	N/A
	1 to 2 years of Cover	22-111	30.5	N/A
	2 to 5 years of Cover	22-112	40	N/A
General	Sandy Roadside	25-121	61	Mow up to 3 times per year
	General Roadside	25-141	59	Mow up to 3 times per year
	Commercial Turf	25-131	220	Mow a minimum of once per 4 weeks
	Residential Turf	25-151	120	Mow a minimum of once per 2 weeks
	Agricultural Area Roadside	25-142	45	Mow up to 3 times per year
Native	Ponds & Wet Areas in Central, Southern and Western MN	33-261	35	To reduce weed establishment, mow 2 to 3 times (30 days apart) during 1st year with the mower deck about 6"-8" off the ground. Mow one time during the 2nd year before weeds set their seeds. Burn or mow once every 3 to 5 years following the initial 2 years of maintenance to remove dead plant material and stimulate new seed.
	Ponds & Wet Areas in Northeast MN	33-361	35	
	Sandy/dry Areas- Short Grasses	35-221	36.5	
	General Roadside	35-241	36.5	
	Wet Prairie	34-262	14.5	
	Riparian areas in Central, Southern, and Western MN	34-261	31.5	
	Riparian areas in Northeast MN	34-361	31.5	
	Partly shaded roadsides in Southern and Western MN	36-211	34.5	
	Partly shaded roadsides in Northeast MN	36-311	33.5	
	Partly shaded roadsides in Northwest MN	36-411	35.5	
	Partly shaded roadsides in Central MN	36-711	35.5	

Season of Planting

The season of planting for seed mixtures runs from spring to early summer and from fall until the ground freezes. **Table 2** lists the general dates when seeding of various Mn/DOT mixes should occur. Seasons can be extended based on the current weather patterns, such as frequent low intensity rainfalls with cooler than average temperatures.

Table 2
SEASON OF PLANTING

Seed Mixture Number	Spring	Fall
21-112	---	Aug. 1 – Oct. 1
21-111 & 21-113	May 1 – Aug. 1	---
22-111, 22-112	April 1 - July 20.	July 20 – Oct. 20
25-121, 25-141, 25-131, 25-151	April 1 - June 1	July 20 - Sept. 20
25-142	April 1 – Sept. 1	---
Mixes beginning with number 3	April 15 – July 20	Sept. 20 – Oct. 20

Note: For the portion of Minnesota north of, and including TH 2, the Season of Planting for Mixtures 22-111 through 25-151 shall be April 15 through September 20.

Dormant Seeding

When dormant seeding, it is important to note different species are dormant at different times of the year. Dormant seeding for warm-season grasses occurs in early fall as they require 65 °F and above sustained soil temperatures and moisture to germinate. Cool-season grasses will germinate at colder temperatures, a soil temperature at a depth of 1" at or below 40 °F. Cool-season grasses generally germinate in a shorter period of time. Many forbs will not germinate at all the first year when seeded in the spring as they require a freeze/thaw period (winter) to germinate. Thus, forbs may not appear until the following spring. Dormant seeding is somewhat risky due to factors such as weather, snow cover, predation, and soil erosion. However, plantings do appear to contain more diversity of cool-season grasses and forbs when installed in the fall.

Snow Seeding

Seeding on top of the snow with a prepared seedbed below the snow is considered snow seeding and usually performed due to contract constraints. When this is done the seed will melt through the snow and germinate when it reached the correct temperature in the spring. Mulch can also be placed over the snow on top of the seeded site. Snow seeding can be done during the thawing days in February and March.

Seed Mix Conversion Table

Table 3: Seed Mixes

Click the mix number to see details for each mix

CATEGORY	NUMBER	PLS Rate	NAME	REPLACES
Cover Crop				
	21-111	100	Oats Cover Crop	MNDOT 110, BWSR UT1
	21-112	100	Winter Wheat Cover Crop	MNDOT 100
	21-113	110	Soil Building Cover Crop	MNDOT 130
Mid-Term Stabilization				
	22-111	30.5	Two-year Stabilization	MNDOT 150
	22-112	40.0	Five-year Stabilization	MNDOT 190
Non-Native Grassland				
	25-121	61.0	Sandy General Roadside	MNDOT 240
	25-131	220	Low Maintenance Turf	MNDOT 260
	25-141	59	Mesic General Roadside	MNDOT 250
	25-142	45	Agricultural Roadside	MNDOT 280
	25-151	120	High Maintenance Turf	MNDOT 270
Mid-term Stabilization Native				
	32-241	38	Native Construction	BWSR U12, BWSR U11
Stormwater Facilities				
	33-261	35	Stormwater South and West	MNDOT 310 & 328
	33-262	44	Dry Swale / Pond	BWSR W4
	33-361	35	Stormwater Northeast	BWSR W7, MNDOT 310 & 328
Wetland				
	34-171	5.3	Wetland Rehabilitation	BWSR WT3
	34-181	5	Emergent Wetland	BWSR W1
	34-261	31.5	Riparian South & West	BWSR R1
	34-262	14.5	Wet Prairie	BWSR W3, MNDOT 325
	34-271	12	Wet Meadow South & West	BWSR W2
	34-361	31.5	Riparian Northeast	BWSR R1
	34-371	12.5	Wet Meadow Northeast	BWSR W2N
Native Grassland				
	35-221	36.5	Dry Prairie General	MNDOT 330
	35-241	36.5	Mesic Prairie General	MNDOT 350
	35-421	11	Dry Prairie Northwest	BWSR U2
	35-441	11	Mesic Prairie Northwest	BWSR U1
	35-521	12.5	Dry Prairie Southwest	BWSR U4
	35-541	12	Mesic Prairie Southwest	BWSR U3
	35-621	11	Dry Prairie Southeast	BWSR U6
	35-641	12	Mesic Prairie Southeast	BWSR U5
Woodland				
	36-211	34.5	Woodland Edge South & West	BWSR U7
	36-311	33.5	Woodland Edge Northeast	BWSR U13, BWSR U14
	36-411	35.5	Woodland Edge Northwest	
	36-711	35.5	Woodland Edge Central	

Seed Mixes

21-111 Oats Cover Crop

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
Oats	*Avena sativa*	100.00	112.08	100.00%	44.54
	Total	100.00	112.08	100.00%	44.54
Purpose:	Temporary cover crop for spring and summer plantings				
Planting Area:	Statewide				

21-112 Winter Wheat Cover Crop

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
Winter Wheat	*Triticum aestivum*	100.00	112.09	100.00%	26.08
	Total	100.00	112.09	100.00%	26.08
Purpose:	Temporary cover crop for fall plantings				
Planting Area:	Statewide				

21-113 Soil Building Cover Crop

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
Field Pea	*Pisum sativum*	50.00	56.04	45.46%	3.44
	Forbs Subtotal	50.00	56.04	45.46%	3.44
Oats	*Avena sativa*	60.00	67.25	54.54%	26.72
	Cover Crop Subtotal	60.00	67.25	54.54%	26.72
	Total	110.00	123.29	100.00%	30.16
Purpose:	Temporary cover crop with soil building function.				
Planting Area:	Statewide				
Combine all components when blending this mix.					

22-111 Two-year Stabilization

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
slender wheatgrass	*Elymus trachycaulus*	9.00	10.09	29.50%	22.80
Perennial Ryegrass	*Lolium perenne*	4.50	5.04	14.76%	22.42
	Grasses Subtotal	13.50	15.13	44.26%	45.22
Alfalfa	*Medicago sativa*	8.50	9.53	27.86%	44.25
Red Clover	*Trifolium pratense*	8.50	9.53	27.88%	53.13
	Forbs Subtotal	17.00	19.05	55.74%	97.38
	Total	30.50	34.19	100.00%	142.60
Purpose:	One to two year soil stabilization with non-native species				
Planting Area:	Statewide				
Combine all components when blending this mix.					

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22-112 **Five-year Stabilization**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
Perennial Ryegrass	*Lolium perenne*	13.50	15.13	33.75%	67.25
Smooth Brome	*Bromus inermis*	6.00	6.73	14.99%	19.67
slender wheatgrass	*Elymus trachycaulus*	2.00	2.24	5.01%	5.08
big bluestem	*Andropogon gerardii*	0.50	0.56	1.25%	1.83
	Grasses Subtotal	22.00	24.66	55.00%	93.83
Alfalfa	*Medicago sativa*	8.50	9.53	21.25%	44.25
Red Clover	*Trifolium pratense*	5.50	6.16	13.74%	34.35
Alsike Clover	*Trifolium hybridum*	3.50	3.92	8.75%	54.70
American vetch	*Vicia americana*	0.50	0.56	1.26%	0.38
	Forbs Subtotal	18.00	20.18	45.00%	133.68
	Total	40.00	44.83	100.00%	227.51
Purpose:	Two to five year soil stabilization with non-native species.				
Planting Area:	Statewide				
Combine all components when blending this mix.					

25-121 **Sandy General Roadside**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
Park Kentucky bluegrass	*Poa pratensis Park*	16.00	17.93	26.23%	510.50
Perennial Ryegrass	*Lolium perenne*	13.50	15.13	22.13%	67.25
Smooth Brome	*Bromus inermis*	8.00	8.97	13.12%	26.25
Canada bluegrass*	*Poa compressa*	7.75	8.69	12.70%	425.50
Hard fescue	*Festuca trachyphylla*	4.25	4.76	6.96%	55.10
slender wheatgrass	*Elymus trachycaulus*	2.00	2.24	3.29%	5.08
switchgrass	*Panicum virgatum*	1.50	1.68	2.46%	7.73
little bluestem	*Schizachyrium scoparium*	1.50	1.68	2.46%	8.28
sand dropseed	*Sporobolus cryptandrus*	1.50	1.68	2.45%	110.00
	Grasses Subtotal	56.00	62.77	91.80%	1215.69
Red Clover	*Trifolium pratense*	4.50	5.04	7.38%	28.13
purple prairie clover	*Dalea purpurea*	0.50	0.56	0.82%	2.75
	Forbs Subtotal	5.00	5.60	8.20%	30.88
	Total	61.00	68.37	100.00%	1246.57
Purpose:	General non-native roadside for dry or sandy soils.				
Planting Area:	Statewide. Well suited for Pine Moraines & Outwash Plains, Mille Lacs Uplands, and Anoka Sand Plain subsections. Mn/DOT Distrct 3A and eastern 3B				
Combine all components when blending this mix. *Species in the sheeps fescue complex (Festuca spp.) may be used interchangeably with Canada bluegrass in this mix. Varieties must match those listed on the substitution table.					

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25-131 **Low Maintenance Turf**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
red fescue	*Festuca rubra*	64.00	71.73	29.09%	667.00
Chewing's Fescue	*Festuca rubra ssp. commutata*	44.00	49.32	20.00%	458.60
Low Maintenance Kentucky bluegrass	*Poa pratensis Low Maintenance*	36.00	40.35	16.36%	1148.70
Hard fescue	*Festuca trachyphylla*	30.00	33.63	13.64%	389.10
Sheep Fescue	*Festuca ovina*	25.00	28.02	11.37%	304.22
Perennial Ryegrass	*Lolium perenne*	21.00	23.54	9.54%	104.60
	Total	220.00	246.59	100.00%	3072.22
Purpose:	Salt, shade and drought tolerant turfgrass. Requires less frequent mowing and less fertilization than conventional turfgrass.				
Planting Area:	Statewide				
Combine all components when blending this mix.					

25-141 **Mesic General Roadside**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
Park Kentucky bluegrass	*Poa pratensis Park*	15.75	17.65	26.69%	502.50
Perennial Ryegrass	*Lolium perenne*	13.25	14.85	22.46%	66.00
Smooth Brome	*Bromus inermis*	7.75	8.69	13.14%	25.42
Canada bluegrass*	*Poa compressa*	7.50	8.41	12.71%	412.00
fowl bluegrass	*Poa palustris*	4.00	4.48	6.78%	191.00
slender wheatgrass	*Elymus trachycaulus*	2.00	2.24	3.40%	5.08
Timothy	*Phleum pratense*	1.75	1.96	2.97%	49.50
switchgrass	*Panicum virgatum*	1.50	1.68	2.54%	7.70
	Grasses Subtotal	53.50	59.97	90.69%	1259.20
Alfalfa	*Medicago sativa*	3.50	3.92	5.92%	18.20
White Clover	*Trifolium repens*	2.00	2.24	3.39%	32.70
	Forbs Subtotal	5.50	6.16	9.31%	50.90
	Total	59.00	66.13	100.00%	1310.10
Purpose:	General non-native mix for roadsides with mesic soils.				
Planting Area:	Statewide				
Combine all components when blending this mix. *Species in the sheeps fescue complex (Festuca spp.) may be used interchangeably with Canada bluegrass in this mix. Varieties must match those listed on the substitution table.					

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25-142 **Agricultural Roadside**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
Perennial Ryegrass	*Lolium perenne*	13.50	15.13	30.00%	67.25
Smooth Brome	*Bromus inermis*	7.75	8.69	17.23%	25.43
fowl bluegrass	*Poa palustris*	6.00	6.73	13.33%	286.50
slender wheatgrass	*Elymus trachycaulus*	2.00	2.24	4.45%	5.08
Timothy	*Phleum pratense*	1.75	1.96	3.89%	49.43
switchgrass	*Panicum virgatum*	1.50	1.68	3.33%	7.70
	Grasses Subtotal	32.50	36.43	72.23%	441.39
Alfalfa	*Medicago sativa*	12.50	14.01	27.77%	65.07
	Forbs Subtotal	12.50	14.01	27.77%	65.07
	Total	45.00	50.44	100.00%	506.46
Purpose:	General non-native roadside for areas that will be cut for hay.				
Planting Area:	Statewide				
Combine all components when blending this mix.					

25-151 **High Maintenance Turf**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
Elite Kentucky bluegrass	*Poa pratensis Elite*	30.00	33.63	25.00%	957.30
Low Maintenance Kentucky bluegrass	*Poa pratensis Low Maintenance*	30.00	33.63	25.00%	957.30
Park Kentucky bluegrass	*Poa pratensis Park*	30.00	33.63	25.00%	957.30
Perennial Ryegrass	*Lolium perenne*	20.40	22.87	17.00%	101.65
red fescue	*Festuca rubra*	9.60	10.76	8.00%	100.10
	Total	120.00	134.50	100.00%	3073.65
Purpose:	Conventional turfgrass. Not salt, shade or drought tolerant. Requires more mowing, fertilizer and water than the low maintenance turf mix.				
Planting Area:	Statewide				
Combine all components when blending this mix.					

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32-241 **Native Construction**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
slender wheatgrass	*Elymus trachycaulus*	2.50	2.80	6.57%	6.33
nodding wild rye	*Elymus canadensis*	2.00	2.24	5.26%	3.82
Virginia wild rye	*Elymus virginicus*	2.00	2.24	5.26%	3.09
fringed brome	*Bromus ciliatus*	1.40	1.57	3.69%	5.67
big bluestem	*Andropogon gerardii*	1.25	1.40	3.30%	4.60
side-oats grama	*Bouteloua curtipendula*	1.00	1.12	2.64%	2.21
Indian grass	*Sorghastrum nutans*	1.00	1.12	2.63%	4.40
switchgrass	*Panicum virgatum*	0.75	0.84	1.97%	3.85
fowl bluegrass	*Poa palustris*	0.60	0.67	1.57%	28.50
	Grasses Subtotal	12.50	14.01	32.89%	62.47
partridge pea	*Chamaecrista fasiculata*	0.27	0.30	0.72%	0.27
black-eyed susan	*Rudbeckia hirta*	0.09	0.10	0.23%	3.00
Canada tick trefoil	*Desmodium canadense*	0.07	0.08	0.20%	0.15
hoary vervain	*Verbena stricta*	0.05	0.06	0.13%	0.50
wild bergamot	*Monarda fistulosa*	0.02	0.02	0.04%	0.39
	Forbs Subtotal	0.50	0.56	1.32%	4.31
Oats	Avena sativa	25.00	28.02	65.79%	11.14
	Cover Crop Subtotal	25.00	28.02	65.79%	11.14
	Total	38.00	42.59	100.00%	77.91
Purpose:	Mid-term soil stabilization using native species. Also suitable for sides of agricultural drainage ditches or low-diversity mesic prairie planting.				
Planting Area:	Tallgrass Aspen Parklands, Prairie Parkland, and Eastern Broadleaf Forest Provinces. Mn/DOT Districts 2(west), 3B, 4, Metro, 6, 7 & 8.				

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33-261 **Stormwater South & West**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
big bluestem	*Andropogon gerardii*	2.00	2.24	5.72%	7.35
fringed brome	*Bromus ciliatus*	2.00	2.24	5.73%	8.10
Virginia wild rye	*Elymus virginicus*	1.50	1.68	4.28%	2.31
fowl bluegrass	*Poa palustris*	1.06	1.19	3.03%	50.70
slender wheatgrass	*Elymus trachycaulus*	1.00	1.12	2.85%	2.53
switchgrass	*Panicum virgatum*	0.38	0.43	1.07%	1.93
prairie cordgrass	*Spartina pectinata*	0.38	0.43	1.07%	0.91
Indian grass	*Sorghastrum nutans*	0.12	0.13	0.36%	0.55
bluejoint	*Calamagrostis canadensis*	0.06	0.07	0.18%	6.40
	Grasses Subtotal	8.50	9.53	24.29%	80.78
awl-fruited sedge	*Carex stipata*	0.25	0.28	0.71%	3.10
dark green bulrush	*Scirpus atrovirens*	0.19	0.21	0.54%	31.70
woolgrass	*Scirpus cyperinus*	0.06	0.07	0.18%	39.00
	Sedges & Rushes Subtotal	0.50	0.56	1.43%	73.80
golden alexanders	*Zizia aurea*	0.20	0.22	0.56%	0.79
autumn sneezeweed	*Helenium autumnale*	0.13	0.15	0.36%	5.97
marsh milkweed	*Asclepias incarnata*	0.11	0.12	0.32%	0.20
leafy beggarticks	*Bidens frondosa*	0.11	0.12	0.31%	0.20
Canada anemone	*Anemone canadensis*	0.07	0.08	0.19%	0.20
obedient plant	*Physostegia virginiana*	0.07	0.08	0.21%	0.30
tall coneflower	*Rudbeckia laciniata*	0.07	0.08	0.21%	0.37
New England aster	*Symphyotrichum novae-angliae*	0.07	0.08	0.19%	1.56
flat-topped aster	*Doellingeria umbellata*	0.06	0.07	0.17%	1.50
spotted Joe pye weed	*Eutrochium maculatum*	0.06	0.07	0.18%	2.19
blue vervain	*Verbena hastata*	0.05	0.06	0.15%	1.85
	Forbs Subtotal	1.00	1.12	2.85%	15.13
Oats	*Avena sativa*	25.00	28.02	71.43%	11.14
	Cover Crop Subtotal	25.00	28.02	71.43%	11.14
	Total	35.00	39.23	100.00%	180.85
Purpose:	Stormwater pond edges, temporarily flooded dry ponds, and temporarily flooded ditch bottoms.				
Planting Area:	Tallgrass Aspen Parklands, Prairie Parkland, and Eastern Broadleaf Forest Provinces. Mn/DOT Districts 2(west), 3B, 4, Metro, 6, 7 & 8.				

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33-262 **Dry Swale / Pond**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
nodding wild rye	*Elymus canadensis*	4.00	4.48	9.09%	7.64
slender wheatgrass	*Elymus trachycaulus*	4.00	4.48	9.10%	10.15
Virginia wild rye	*Elymus virginicus*	2.50	2.80	5.67%	3.85
fowl bluegrass	*Poa palustris*	1.60	1.79	3.64%	76.50
big bluestem	*Andropogon gerardii*	1.50	1.68	3.40%	5.50
American slough grass	*Beckmannia syzigachne*	1.50	1.68	3.42%	27.60
fringed brome	*Bromus ciliatus*	1.50	1.68	3.40%	6.05
Indian grass	*Sorghastrum nutans*	1.50	1.68	3.40%	6.60
switchgrass	*Panicum virgatum*	0.40	0.45	0.91%	2.05
	Grasses Subtotal	18.50	20.74	42.03%	145.94
blue vervain	*Verbena hastata*	0.10	0.11	0.23%	3.50
purple prairie clover	*Dalea purpurea*	0.09	0.10	0.21%	0.50
Canada tick trefoil	*Desmodium canadense*	0.09	0.10	0.21%	0.19
Early Sunflower	*Heliopsis helianthoides*	0.09	0.10	0.20%	0.20
black-eyed susan	*Rudbeckia hirta*	0.07	0.08	0.17%	2.49
marsh milkweed	*Asclepias incarnata*	0.06	0.07	0.13%	0.10
	Forbs Subtotal	0.50	0.56	1.15%	6.98
Oats	*Avena sativa*	25.00	28.02	56.82%	11.14
	Cover Crop Subtotal	25.00	28.02	56.82%	11.14
	Total	44.00	49.32	100.00%	164.06
Purpose:	Temporarily flooded swales in agricultural settings.				
Planting Area:	Tallgrass Aspen Parklands, Prairie Parkland, and Eastern Broadleaf Forest Provinces. Mn/DOT Districts 2(west), 3B, 4, Metro, 6, 7 & 8.				

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33-361 **Stormwater Northeast**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
fringed brome	*Bromus ciliatus*	3.65	4.09	10.43%	14.75
nodding wild rye	*Elymus canadensis*	2.00	2.24	5.71%	3.82
Virginia wild rye	*Elymus virginicus*	2.00	2.24	5.73%	3.09
fowl bluegrass	*Poa palustris*	0.64	0.72	1.82%	30.40
tall manna grass	*Glyceria grandis*	0.16	0.18	0.44%	4.00
bluejoint	*Calamagrostis canadensis*	0.05	0.06	0.13%	4.80
	Grasses Subtotal	8.50	9.53	24.26%	60.86
dark green bulrush	*Scirpus atrovirens*	0.27	0.30	0.76%	45.00
woolgrass	*Scirpus cyperinus*	0.10	0.11	0.27%	60.00
porcupine sedge	*carex hystericina*	0.09	0.10	0.26%	1.00
pointed broom sedge	*Carex scoparia*	0.04	0.04	0.12%	1.30
	Sedges & Rushes Subtotal	0.50	0.56	0.12%	107.30
marsh milkweed	*Asclepias incarnata*	0.45	0.50	1.30%	0.80
spotted Joe pye weed	*Eutrochium maculatum*	0.15	0.17	0.42%	5.10
Canada anemone	*Anemone canadensis*	0.10	0.11	0.29%	0.30
flat-topped aster	*Doellingeria umbellata*	0.10	0.11	0.29%	2.50
common boneset	*Eupatorium perfoliatum*	0.05	0.06	0.15%	3.00
tall meadow-rue	*Thalictrum dasycarpum*	0.05	0.06	0.16%	0.40
grass-leaved goldenrod	*Euthamia graminifolia*	0.04	0.04	0.11%	5.00
blue monkey flower	*Mimulus ringens*	0.02	0.02	0.07%	20.00
giant goldenrod	*Solidago gigantea*	0.02	0.02	0.06%	2.00
eastern panicled aster	*Symphyotrichum lanceolatum*	0.02	0.02	0.05%	1.00
	Forbs Subtotal	1.00	1.12	2.90%	40.10
Oats	*Avena sativa*	25.00	28.02	71.43%	11.14
	Cover Crop Subtotal	25.00	28.02	71.43%	11.14
	Total	35.00	39.23	100.00%	219.40
Purpose:	Stormwater pond edges, temporarily flooded dry ponds, and temporarily flooded ditch bottoms.				
Planting Area:	Laurentian Mixed Forest Province. Mn/DOT Districts 1, 2(east) and 3A.				

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34-171 **Wetland Rehabilitation**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
Virginia wild rye	*Elymus virginicus*	3.00	3.36	56.61%	4.63
fowl bluegrass	*Poa palustris*	1.00	1.12	18.89%	47.80
	Grasses Subtotal	4.00	4.48	75.50%	52.43
dark green bulrush	*Scirpus atrovirens*	0.36	0.40	6.70%	60.00
fox sedge	*Carex vulpinoidea*	0.20	0.22	3.85%	7.50
path rush	*Juncus tenuis*	0.16	0.18	3.03%	59.00
woolgrass	*Scirpus cyperinus*	0.08	0.09	1.51%	50.00
	Sedges & Rushes Subtotal	0.80	0.90	15.09%	176.50
Water Horehound	*Lycopus americanus*	0.33	0.37	6.29%	23.15
nodding bur marigold	*Bidens cernua*	0.13	0.15	2.45%	1.00
blue monkey flower	*Mimulus ringens*	0.04	0.04	0.67%	30.00
	Forbs Subtotal	0.50	0.56	9.41%	54.15
	Total	5.30	5.94	100.00%	283.08
Purpose:	Interseeding into establishing wetlands after weed control spraying. Also suitable for two to five year short term soil stabilization for areas with saturated soils.				
Planting Area:	Statewide				

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34-181 **Emergent Wetland**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
American slough grass	*Beckmannia syzigachne*	0.70	0.78	14.07%	12.92
rice cut grass	*Leersia oryzoides*	0.30	0.34	5.93%	3.70
tall manna grass	*Glyceria grandis*	0.25	0.28	4.98%	6.40
	Grasses Subtotal	1.25	1.40	24.98%	23.02
river bulrush	*Bolboschoenus fluviatilis*	0.76	0.85	15.20%	1.20
soft stem bulrush	*Schoenoplectus tabernaemontani*	0.44	0.49	8.78%	5.00
Three-square bulrush	*Schoenoplectus pungens*	0.23	0.26	4.54%	1.00
bristly sedge	*Carex comosa*	0.18	0.20	3.63%	2.00
least spikerush	*Eleocharis acicularis*	0.10	0.11	1.94%	2.50
marsh spikerush	*Eleocharis palustris*	0.10	0.11	2.03%	1.90
lake sedge	*Carex lacustris*	0.06	0.07	1.19%	0.24
woolgrass	*Scirpus cyperinus*	0.05	0.06	1.02%	32.00
tussock sedge	*Carex stricta*	0.04	0.04	0.77%	0.75
Torrey's rush	*Juncus torreyi*	0.04	0.04	0.85%	25.00
	Sedges & Rushes Subtotal	2.00	2.24	39.95%	71.59
giant bur reed	*Sparganium eurycarpum*	0.49	0.55	9.80%	0.09
common water plantain	*Alisma triviale*	0.40	0.45	8.00%	9.70
broad-leaved arrowhead	*Sagittaria latifolia*	0.30	0.34	6.07%	6.80
Sweet flag	*Acorus americanus*	0.28	0.31	5.53%	0.67
marsh milkweed	*Asclepias incarnata*	0.28	0.31	5.67%	0.50
	Forbs Subtotal	1.75	1.96	35.07%	17.76
	Total	5.00	5.60	100.00%	112.37
Purpose:	Emergent wetland restoration for use in wetland mitigation, shoreline restoration, wet stormwater ponds where emergent vegetation is desired.				
Planting Area:	Statewide				

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34-261 **Riparian South & West**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
Virginia wild rye	*Elymus virginicus*	1.75	1.96	5.56%	2.70
American slough grass	*Beckmannia syzigachne*	1.36	1.52	4.30%	24.90
fowl bluegrass	*Poa palustris*	0.84	0.94	2.66%	40.00
riverbank wild rye	*Elymus riparius*	0.50	0.56	1.58%	0.53
prairie cordgrass	*Spartina pectinata*	0.30	0.34	0.96%	0.74
tall manna grass	*Glyceria grandis*	0.25	0.28	0.80%	6.50
rice cut grass	*Leersia oryzoides*	0.16	0.18	0.51%	2.00
fowl manna grass	*Glyceria striata*	0.09	0.10	0.29%	3.00
	Grasses Subtotal	5.25	5.88	16.66%	80.37
fox sedge	*Carex vulpinoidea*	0.20	0.22	0.65%	7.50
dark green bulrush	*Scirpus atrovirens*	0.12	0.13	0.38%	20.00
pointed broom sedge	*Carex scoparia*	0.06	0.07	0.21%	2.00
woolgrass	*Scirpus cyperinus*	0.05	0.06	0.15%	30.00
tussock sedge	*Carex stricta*	0.04	0.04	0.13%	0.80
path rush	*Juncus tenuis*	0.03	0.03	0.09%	10.00
	Sedges & Rushes Subtotal	0.50	0.56	1.61%	70.30
blue vervain	*Verbena hastata*	0.15	0.17	0.46%	5.00
marsh milkweed	*Asclepias incarnata*	0.12	0.13	0.38%	0.21
giant sunflower	*Helianthus giganteus*	0.07	0.08	0.22%	0.25
spotted Joe pye weed	*Eutrochium maculatum*	0.06	0.07	0.18%	2.00
bunched ironweed	*Vernonia fasciculata*	0.06	0.07	0.18%	0.50
autumn sneezeweed	*Helenium autumnale*	0.05	0.06	0.17%	2.50
spotted touch-me-not	*Impatiens capensis*	0.05	0.06	0.17%	0.08
Virginia mountain mint	*Pycnanthemum virginianum*	0.05	0.06	0.16%	4.00
tall coneflower	*Rudbeckia laciniata*	0.05	0.06	0.15%	0.25
common boneset	*Eupatorium perfoliatum*	0.03	0.03	0.11%	2.00
great lobelia	*Lobelia siphilitica*	0.03	0.03	0.09%	5.00
giant goldenrod	*Solidago gigantea*	0.02	0.02	0.07%	2.00
blue monkey flower	*Mimulus ringens*	0.01	0.01	0.02%	5.07
	Forbs Subtotal	0.75	0.84	2.36%	28.86
Oats	*Avena sativa*	25.00	28.02	79.37%	11.14
	Cover Crop Subtotal	25.00	28.02	79.37%	11.14
	Total	31.50	35.31	100.00%	190.66
Purpose:	Native riparian and floodplain plantings for wetland mitigation, ecological restoration, or general permanent cover after culvert or bridge work. Tolerates partial shade.				
Planting Area:	Tallgrass Aspen Parklands, Prairie Parkland, and Eastern Broadleaf Forest Provinces. Mn/DOT Districts 2(west), 3B, 4, Metro, 6, 7 & 8.				

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34-262 **Wet Prairie**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
Virginia wild rye	*Elymus virginicus*	1.75	1.96	12.07%	2.70
fringed brome	*Bromus ciliatus*	1.50	1.68	10.38%	6.08
big bluestem	*Andropogon gerardii*	1.00	1.12	6.89%	3.67
switchgrass	*Panicum virgatum*	0.75	0.84	5.16%	3.85
Indian grass	*Sorghastrum nutans*	0.50	0.56	3.44%	2.20
prairie cordgrass	*Spartina pectinata*	0.50	0.56	3.41%	1.20
fowl bluegrass	*Poa palustris*	0.20	0.22	1.39%	9.60
tall manna grass	*Glyceria grandis*	0.15	0.17	1.02%	3.80
fowl manna grass	*Glyceria striata*	0.11	0.12	0.73%	3.50
bluejoint	*Calamagrostis canadensis*	0.04	0.04	0.27%	4.00
	Grasses Subtotal	6.50	7.29	44.76%	40.60
fox sedge	*Carex vulpinoidea*	0.10	0.11	0.66%	3.50
dark green bulrush	*Scirpus atrovirens*	0.10	0.11	0.72%	17.74
Broad-leaved Wooly Sedge	*Carex pellita*	0.05	0.06	0.32%	0.47
woolgrass	*Scirpus cyperinus*	0.03	0.03	0.18%	16.00
tussock sedge	*Carex stricta*	0.02	0.02	0.17%	0.48
	Sedges & Rushes Subtotal	0.30	0.34	2.05%	38.19
Canada tick trefoil	*Desmodium canadense*	0.50	0.56	3.41%	1.00
golden alexanders	*Zizia aurea*	0.25	0.28	1.76%	1.03
blue vervain	*Verbena hastata*	0.15	0.17	1.06%	5.25
marsh milkweed	*Asclepias incarnata*	0.08	0.09	0.55%	0.14
Virginia mountain mint	*Pycnanthemum virginianum*	0.08	0.09	0.55%	6.50
red-stemmed aster	*Symphyotrichum puniceum*	0.08	0.09	0.56%	2.40
flat-topped aster	*Doellingeria umbellata*	0.05	0.06	0.34%	1.20
autumn sneezeweed	*Helenium autumnale*	0.05	0.06	0.35%	2.39
sawtooth sunflower	*Helianthus grosseserratus*	0.05	0.06	0.38%	0.30
spotted Joe pye weed	*Eutrochium maculatum*	0.04	0.04	0.30%	1.50
Canada anemone	*Anemone canadensis*	0.03	0.03	0.21%	0.09
common boneset	*Eupatorium perfoliatum*	0.03	0.03	0.23%	2.00
bunched ironweed	*Vernonia fasciculata*	0.03	0.03	0.23%	0.30
grass-leaved goldenrod	*Euthamia graminifolia*	0.02	0.02	0.11%	2.00
great blazing star	*Liatris pycnostachya*	0.02	0.02	0.17%	0.10
Culver's root	*Veronicastrum virginicum*	0.02	0.02	0.14%	6.00
great lobelia	*Lobelia siphilitica*	0.01	0.01	0.05%	1.40
blue monkey flower	*Mimulus ringens*	0.01	0.01	0.05%	6.40
	Forbs Subtotal	1.50	1.68	10.45%	40.00
Oats	*Avena sativa*	6.20	6.95	42.74%	2.76
	Cover Crop Subtotal	6.20	6.95	42.74%	2.76
	Total	14.50	16.25	100.00%	121.55
Purpose:	Wet prairie reconstruction for wetland mitigation or ecological restoration.				
Planting Area:	Tallgrass Aspen Parklands, Prairie Parkland, and Eastern Broadleaf Forest Provinces. Mn/DOT Districts 2(west), 3B, 4, Metro, 6, 7 & 8.				

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34-271 **Wet Meadow South & West**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
fringed brome	*Bromus ciliatus*	1.10	1.23	9.18%	4.45
Virginia wild rye	*Elymus virginicus*	1.00	1.12	8.37%	1.55
fowl bluegrass	*Poa palustris*	0.35	0.39	2.88%	16.50
rice cut grass	*Leersia oryzoides*	0.25	0.28	2.07%	3.10
tall manna grass	*Glyceria grandis*	0.15	0.17	1.26%	3.90
fowl manna grass	*Glyceria striata*	0.10	0.11	0.83%	3.30
bluejoint	*Calamagrostis canadensis*	0.05	0.06	0.41%	5.00
	Grasses Subtotal	3.00	3.36	25.00%	37.80
bristly sedge	*Carex comosa*	0.21	0.24	1.78%	2.36
dark green bulrush	*Scirpus atrovirens*	0.18	0.20	1.48%	30.00
awl-fruited sedge	*Carex stipata*	0.17	0.19	1.40%	2.10
fox sedge	*Carex vulpinoidea*	0.14	0.16	1.13%	5.00
woolgrass	*Scirpus cyperinus*	0.08	0.09	0.67%	50.00
pointed broom sedge	*Carex scoparia*	0.05	0.06	0.43%	1.60
path rush	*Juncus tenuis*	0.04	0.04	0.34%	15.00
tussock sedge	*Carex stricta*	0.03	0.03	0.21%	0.50
	Sedges & Rushes Subtotal	0.90	1.01	7.44%	106.56
golden alexanders	*Zizia aurea*	0.25	0.28	2.06%	1.00
marsh milkweed	*Asclepias incarnata*	0.24	0.27	2.03%	0.43
red-stemmed aster	*Symphyotrichum puniceum*	0.17	0.19	1.42%	5.00
blue vervain	*Verbena hastata*	0.13	0.15	1.12%	4.61
Virginia mountain mint	*Pycnanthemum virginianum*	0.06	0.07	0.53%	5.10
sawtooth sunflower	*Helianthus grosseserratus*	0.04	0.04	0.30%	0.20
autumn sneezeweed	*Helenium autumnale*	0.03	0.03	0.23%	1.30
eastern panicled aster	*Symphyotrichum lanceolatum*	0.03	0.03	0.22%	1.50
bunched ironweed	*Vernonia fasciculata*	0.03	0.03	0.28%	0.30
common boneset	*Eupatorium perfoliatum*	0.02	0.02	0.18%	1.30
spotted Joe pye weed	*Eutrochium maculatum*	0.02	0.02	0.18%	0.75
great lobelia	*Lobelia siphilitica*	0.02	0.02	0.13%	2.90
giant goldenrod	*Solidago gigantea*	0.02	0.02	0.14%	1.50
grass-leaved goldenrod	*Euthamia graminifolia*	0.01	0.01	0.06%	1.00
blue monkey flower	*Mimulus ringens*	0.01	0.01	0.07%	6.80
tall meadow-rue	*Thalictrum dasycarpum*	0.01	0.01	0.12%	0.11
Culver's root	*Veronicastrum virginicum*	0.01	0.01	0.12%	4.20
	Forbs Subtotal	1.10	1.23	9.19%	38.00
Oats	*Avena sativa*	7.00	7.85	58.37%	3.12
	Cover Crop Subtotal	7.00	7.85	58.37%	3.12
	Total	12.00	13.45	100.00%	185.48
Purpose:	Wet meadow / Sedge meadow reconstruction for wetland mitigation or ecological restoration projects				
Planting Area:	Tallgrass Aspen Parklands, Prairie Parkland, and Eastern Broadleaf Forest Provinces. Mn/DOT Districts 2(west), 3B, 4, Metro, 6, 7 & 8.				

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34-361 **Riparian Northeast**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
Virginia wild rye	*Elymus virginicus*	2.00	2.24	6.33%	3.08
American slough grass	*Beckmannia syzigachne*	1.50	1.68	4.78%	27.64
fowl bluegrass	*Poa palustris*	0.70	0.78	2.23%	33.50
riverbank wild rye	*Elymus riparius*	0.50	0.56	1.57%	0.53
tall manna grass	*Glyceria grandis*	0.25	0.28	0.80%	6.50
rice cut grass	*Leersia oryzoides*	0.15	0.17	0.49%	1.93
fowl manna grass	*Glyceria striata*	0.09	0.10	0.29%	3.00
bluejoint	*Calamagrostis canadensis*	0.06	0.07	0.19%	6.00
	Grasses Subtotal	5.25	5.88	16.68%	82.18
fox sedge	*Carex vulpinoidea*	0.20	0.22	0.65%	7.50
dark green bulrush	*Scirpus atrovirens*	0.12	0.13	0.38%	20.00
pointed broom sedge	*Carex scoparia*	0.06	0.07	0.21%	2.00
woolgrass	*Scirpus cyperinus*	0.05	0.06	0.15%	30.00
tussock sedge	*Carex stricta*	0.04	0.04	0.13%	0.80
path rush	*Juncus tenuis*	0.03	0.03	0.09%	10.00
	Sedges & Rushes Subtotal	0.50	0.56	1.61%	70.30
blue vervain	*Verbena hastata*	0.22	0.25	0.68%	7.35
marsh milkweed	*Asclepias incarnata*	0.12	0.13	0.38%	0.21
spotted Joe pye weed	*Eutrochium maculatum*	0.11	0.12	0.34%	3.70
grass-leaved goldenrod	*Euthamia graminifolia*	0.07	0.08	0.22%	9.00
giant sunflower	*Helianthus giganteus*	0.07	0.08	0.22%	0.25
common boneset	*Eupatorium perfoliatum*	0.05	0.06	0.16%	3.00
flat-topped aster	*Doellingeria umbellata*	0.04	0.04	0.13%	1.00
spotted touch-me-not	*Impatiens capensis*	0.03	0.03	0.11%	0.05
blue monkey flower	*Mimulus ringens*	0.02	0.02	0.05%	13.00
giant goldenrod	*Solidago gigantea*	0.02	0.02	0.05%	1.50
	Forbs Subtotal	0.75	0.84	2.34%	39.06
Oats	*Avena sativa*	25.00	28.02	79.37%	11.14
	Cover Crop Subtotal	25.00	28.02	79.37%	11.14
	Total	31.50	35.31	100.00%	202.67
Purpose:	Native riparian and floodplain plantings for wetland mitigation, ecological restoration, or general permanent cover after culvert or bridge work. Tolerates partial shade.				
Planting Area:	Laurentian Mixed Forest Province. Mn/DOT Districts 1, 2(east) and 3A.				

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34-371 **Wet Meadow Northeast**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
fringed brome	*Bromus ciliatus*	2.00	2.24	16.04%	8.10
Virginia wild rye	*Elymus virginicus*	1.50	1.68	11.99%	2.31
fowl bluegrass	*Poa palustris*	0.65	0.73	5.19%	31.00
tall manna grass	*Glyceria grandis*	0.25	0.28	1.96%	6.30
bluejoint	*Calamagrostis canadensis*	0.10	0.11	0.78%	10.00
	Grasses Subtotal	4.50	5.04	35.96%	57.71
dark green bulrush	*Scirpus atrovirens*	0.20	0.22	1.56%	33.00
woolgrass	*Scirpus cyperinus*	0.06	0.07	0.51%	40.00
pointed broom sedge	*Carex scoparia*	0.05	0.06	0.39%	1.50
tussock sedge	*Carex stricta*	0.04	0.04	0.35%	0.85
	Sedges & Rushes Subtotal	0.35	0.39	2.81%	75.35
marsh milkweed	*Asclepias incarnata*	0.24	0.27	1.95%	0.43
spotted Joe pye weed	*Eutrochium maculatum*	0.14	0.16	1.15%	5.00
Canada anemone	*Anemone canadensis*	0.10	0.11	0.82%	0.30
flat-topped aster	*Doellingeria umbellata*	0.10	0.11	0.81%	2.50
common boneset	*Eupatorium perfoliatum*	0.09	0.10	0.68%	5.00
grass-leaved goldenrod	*Euthamia graminifolia*	0.04	0.04	0.31%	5.00
blue monkey flower	*Mimulus ringens*	0.03	0.03	0.24%	25.00
giant goldenrod	*Solidago gigantea*	0.03	0.03	0.20%	2.30
eastern panicled aster	*Symphyotrichum lanceolatum*	0.03	0.03	0.28%	2.00
	Forbs Subtotal	0.80	0.90	6.44%	47.53
Oats	*Avena sativa*	6.85	7.68	54.79%	3.05
	Cover Crop Subtotal	6.85	7.68	54.79%	3.05
	Total	12.50	14.01	100.00%	183.64
Purpose:	Wet meadow / Sedge meadow reconstruction for wetland mitigation or ecological restoration.				
Planting Area:	Laurentian Mixed Forest Province. Mn/DOT Districts 1, 2(east) and 3A.				

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35-221 **Dry Prairie General**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
side-oats grama	*Bouteloua curtipendula*	3.00	3.36	8.22%	6.61
little bluestem	*Schizachyrium scoparium*	3.00	3.36	8.22%	16.53
nodding wild rye	*Elymus canadensis*	1.00	1.12	2.74%	1.91
kalm's brome	*Bromus kalmii*	0.73	0.82	2.00%	2.14
big bluestem	*Andropogon gerardii*	0.70	0.78	1.92%	2.57
Indian grass	*Sorghastrum nutans*	0.70	0.78	1.92%	3.09
blue grama	*Bouteloua gracilis*	0.50	0.56	1.37%	7.35
junegrass	*Koeleria macrantha*	0.25	0.28	0.69%	18.37
prairie dropseed	*Sporobolus heterolepis*	0.12	0.13	0.34%	0.73
	Grasses Subtotal	10.00	11.21	27.42%	59.30
black-eyed susan	*Rudbeckia hirta*	0.31	0.35	0.84%	10.32
purple prairie clover	*Dalea purpurea*	0.19	0.21	0.51%	1.02
hoary vervain	*Verbena stricta*	0.13	0.15	0.34%	1.29
lead plant	*Amorpha canescens*	0.09	0.10	0.26%	0.42
blue giant hyssop	*Agastache foeniculum*	0.06	0.07	0.17%	2.07
butterfly milkweed	*Asclepias tuberosa*	0.06	0.07	0.17%	0.10
Canada milk vetch	*Astragalus canadensis*	0.06	0.07	0.18%	0.40
bird's foot coreopsis	*Coreopsis palmata*	0.06	0.07	0.16%	0.21
white prairie clover	*Dalea candida*	0.06	0.07	0.15%	0.39
Canada tick trefoil	*Desmodium canadense*	0.06	0.07	0.18%	0.13
stiff sunflower	*Helianthus pauciflorus*	0.06	0.07	0.17%	0.09
wild bergamot	*Monarda fistulosa*	0.06	0.07	0.15%	1.42
stiff goldenrod	*Oligoneuron rigidum*	0.06	0.07	0.15%	0.83
large-flowered beard tongue	*Penstemon grandiflorus*	0.06	0.07	0.17%	0.32
smooth aster	*Symphyotrichum laeve*	0.06	0.07	0.17%	1.26
rough blazing star	*Liatris aspera*	0.04	0.04	0.12%	0.25
gray goldenrod	*Solidago nemoralis*	0.04	0.04	0.10%	3.86
heath aster	*Symphyotrichum ericoides*	0.04	0.04	0.10%	2.58
	Forbs Subtotal	1.50	1.68	4.09%	26.96
Oats	*Avena sativa*	25.00	28.02	68.49%	11.13
	Cover Crop Subtotal	25.00	28.02	68.49%	11.13
	Total	36.50	40.91	100.00%	97.39
Purpose:	General dry prairie mix for native roadsides, ecological restoration, or conservation program plantings.				
Planting Area:	Tallgrass Aspen Parklands, Prairie Parkland, and Eastern Broadleaf Forest Provinces. Mn/DOT Districts 2(west), 3B, 4, Metro, 6, 7 & 8.				

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35-241 **Mesic Prairie General**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
big bluestem	*Andropogon gerardii*	2.00	2.24	5.48%	7.35
Indian grass	*Sorghastrum nutans*	2.00	2.24	5.48%	8.82
side-oats grama	*Bouteloua curtipendula*	1.60	1.79	4.39%	3.53
little bluestem	*Schizachyrium scoparium*	1.60	1.79	4.39%	8.82
nodding wild rye	*Elymus canadensis*	1.17	1.31	3.20%	2.23
slender wheatgrass	*Elymus trachycaulus*	1.00	1.12	2.73%	2.53
kalm's brome	*Bromus kalmii*	0.50	0.56	1.37%	1.47
prairie dropseed	*Sporobolus heterolepis*	0.07	0.08	0.18%	0.39
switchgrass	*Panicum virgatum*	0.06	0.07	0.17%	0.32
	Grasses Subtotal	10.00	11.21	27.39%	35.46
black-eyed susan	*Rudbeckia hirta*	0.31	0.35	0.86%	10.56
purple prairie clover	*Dalea purpurea*	0.19	0.21	0.51%	1.03
Early Sunflower	*Heliopsis helianthoides*	0.13	0.15	0.34%	0.29
blue giant hyssop	*Agastache foeniculum*	0.06	0.07	0.15%	1.82
lead plant	*Amorpha canescens*	0.06	0.07	0.15%	0.25
Canada milk vetch	*Astragalus canadensis*	0.06	0.07	0.17%	0.39
white prairie clover	*Dalea candida*	0.06	0.07	0.17%	0.44
Canada tick trefoil	*Desmodium canadense*	0.06	0.07	0.18%	0.13
stiff sunflower	*Helianthus pauciflorus*	0.06	0.07	0.17%	0.09
wild bergamot	*Monarda fistulosa*	0.06	0.07	0.17%	1.61
stiff goldenrod	*Oligoneuron rigidum*	0.06	0.07	0.17%	0.94
smooth aster	*Symphyotrichum laeve*	0.06	0.07	0.17%	1.26
hoary vervain	*Verbena stricta*	0.06	0.07	0.17%	0.64
golden alexanders	*Zizia aurea*	0.06	0.07	0.15%	0.23
common milkweed	*Asclepias syriaca*	0.04	0.04	0.10%	0.06
butterfly milkweed	*Asclepias tuberosa*	0.04	0.04	0.10%	0.06
blue vervain	*Verbena hastata*	0.04	0.04	0.12%	1.50
rough blazing star	*Liatris aspera*	0.03	0.03	0.08%	0.18
great blazing star	*Liatris pycnostachya*	0.03	0.03	0.09%	0.13
heath aster	*Symphyotrichum ericoides*	0.03	0.03	0.09%	2.30
	Forbs Subtotal	1.50	1.68	4.11%	23.89
Oats	*Avena sativa*	25.00	28.02	68.50%	11.14
	Cover Crop Subtotal	25.00	28.02	68.50%	11.14
	Total	36.50	40.91	100.00%	70.49
Purpose:	General mesic prairie mix for native roadsides, ecological restoration, or conservation program plantings.				
Planting Area:	Tallgrass Aspen Parklands, Prairie Parkland, and Eastern Broadleaf Forest Provinces. Mn/DOT Districts 2(west), 3B, 4, Metro, 6, 7 & 8.				

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35-421 **Dry Prairie Northwest**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
little bluestem	*Schizachyrium scoparium*	1.50	1.68	13.63%	8.26
side-oats grama	*Bouteloua curtipendula*	1.20	1.35	10.89%	2.64
nodding wild rye	*Elymus canadensis*	1.00	1.12	9.09%	1.91
slender wheatgrass	*Elymus trachycaulus*	1.00	1.12	9.11%	2.54
kalm's brome	*Bromus kalmii*	0.90	1.01	8.17%	2.64
blue grama	*Bouteloua gracilis*	0.75	0.84	6.81%	11.00
porcupine grass	*Hesperostipa spartea*	0.45	0.50	4.09%	0.11
junegrass	*Koeleria macrantha*	0.25	0.28	2.23%	18.00
sand dropseed	*Sporobolus cryptandrus*	0.20	0.22	1.86%	15.00
	Grasses Subtotal	7.25	8.13	65.88%	62.10
purple prairie clover	*Dalea purpurea*	0.11	0.12	0.99%	0.60
Canada milk vetch	*Astragalus canadensis*	0.07	0.08	0.61%	0.42
white prairie clover	*Dalea candida*	0.06	0.07	0.55%	0.42
Early Sunflower	*Heliopsis helianthoides*	0.06	0.07	0.55%	0.14
prairie coneflower	*Ratibida columnifera*	0.06	0.07	0.55%	0.93
black-eyed susan	*Rudbeckia hirta*	0.06	0.07	0.55%	2.03
Canada tick trefoil	*Desmodium canadense*	0.05	0.06	0.45%	0.10
heart-leaved alexanders	*Zizia aptera*	0.05	0.06	0.50%	0.24
Prairie Wild Onion	*Allium stellatum*	0.03	0.03	0.27%	0.12
stiff sunflower	*Helianthus pauciflorus*	0.03	0.03	0.31%	0.05
rough blazing star	*Liatris aspera*	0.03	0.03	0.23%	0.15
wild bergamot	*Monarda fistulosa*	0.03	0.03	0.27%	0.77
stiff goldenrod	*Oligoneuron rigidum*	0.03	0.03	0.27%	0.45
smooth aster	*Symphyotrichum laeve*	0.03	0.03	0.27%	0.61
dotted blazing star	*Liatris punctata*	0.02	0.02	0.18%	0.05
gray goldenrod	*Solidago nemoralis*	0.02	0.02	0.17%	2.00
heath aster	*Symphyotrichum ericoides*	0.01	0.01	0.14%	1.10
	Forbs Subtotal	0.75	0.84	6.86%	10.18
Oats	*Avena sativa*	3.00	3.36	27.26%	1.34
	Cover Crop Subtotal	3.00	3.36	27.26%	1.34
	Total	11.00	12.33	100.00%	73.62
Purpose:	Regional dry prairie reconstruction for wetland mitigation, ecological restoration, or conservation program plantings.				
Planting Area:	Tallgrass Aspen Parklands Province, Red River Prairie Section, Hardwood Hills subsection of the MN & NE IA Morainal Section, far western portions of the Laurentian Mixed Forest Province. Mn/DOT Districts 2(west) & 4(north).				

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35-441 **Mesic Prairie Northwest**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
little bluestem	*Schizachyrium scoparium*	1.50	1.68	13.66%	8.28
side-oats grama	*Bouteloua curtipendula*	1.20	1.35	10.89%	2.64
Indian grass	*Sorghastrum nutans*	1.20	1.35	10.91%	5.29
big bluestem	*Andropogon gerardii*	1.00	1.12	9.08%	3.67
nodding wild rye	*Elymus canadensis*	1.00	1.12	9.09%	1.91
slender wheatgrass	*Elymus trachycaulus*	1.00	1.12	9.11%	2.54
porcupine grass	*Hesperostipa spartea*	0.42	0.47	3.82%	0.11
switchgrass	*Panicum virgatum*	0.18	0.20	1.59%	0.90
	Grasses Subtotal	7.50	8.41	68.15%	25.33
golden alexanders	*Zizia aurea*	0.17	0.19	1.56%	0.70
purple prairie clover	*Dalea purpurea*	0.09	0.10	0.83%	0.50
blue vervain	*Verbena hastata*	0.09	0.10	0.77%	2.91
Canada tick trefoil	*Desmodium canadense*	0.08	0.09	0.77%	0.17
black-eyed susan	*Rudbeckia hirta*	0.07	0.08	0.59%	2.20
Canada milk vetch	*Astragalus canadensis*	0.06	0.07	0.54%	0.37
white prairie clover	*Dalea candida*	0.06	0.07	0.55%	0.42
Early Sunflower	*Heliopsis helianthoides*	0.06	0.07	0.55%	0.14
great blazing star	*Liatris pycnostachya*	0.06	0.07	0.54%	0.24
prairie coneflower	*Ratibida columnifera*	0.06	0.07	0.55%	0.93
Virginia mountain mint	*pycnanthemum virginianum*	0.04	0.04	0.34%	3.00
Prairie Wild Onion	*Allium stellatum*	0.03	0.03	0.27%	0.12
rough blazing star	*Liatris aspera*	0.03	0.03	0.28%	0.18
wild bergamot	*Monarda fistulosa*	0.03	0.03	0.27%	0.77
stiff goldenrod	*Oligoneuron rigidum*	0.03	0.03	0.27%	0.45
smooth aster	*Symphyotrichum laeve*	0.03	0.03	0.27%	0.61
heath aster	*Symphyotrichum ericoides*	0.01	0.01	0.14%	1.10
	Forbs Subtotal	1.00	1.12	9.09%	14.81
Oats	*Avena sativa*	2.50	2.80	22.76%	1.12
	Cover Crop Subtotal	2.50	2.80	22.76%	1.12
	Total	11.00	12.33	100.00%	41.25
Purpose:	Regional mesic prairie reconstruction for wetland mitigation, ecological restoration, or conservation program plantings.				
Planting Area:	Tallgrass Aspen Parklands Province, Red River Prairie Section, Hardwood Hills subsection of the MN & NE IA Morainal Section, may extend into the far western portions of the Laurentian Mixed Forest Province. Mn/DOT Districts 2(west) & 4(north).				

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35-521 **Dry Prairie Southwest**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
little bluestem	*Schizachyrium scoparium*	1.50	1.68	11.96%	8.24
side-oats grama	*Bouteloua curtipendula*	1.40	1.57	11.16%	3.08
nodding wild rye	*Elymus canadensis*	1.20	1.35	9.63%	2.30
slender wheatgrass	*Elymus trachycaulus*	1.00	1.12	7.99%	2.53
blue grama	*Bouteloua gracilis*	0.95	1.06	7.57%	13.90
porcupine grass	*Hesperostipa spartea*	0.75	0.84	6.02%	0.19
junegrass	*Koeleria macrantha*	0.30	0.34	2.40%	22.00
sand dropseed	*Sporobolus cryptandrus*	0.15	0.17	1.20%	11.00
	Grasses Subtotal	7.25	8.13	57.93%	63.23
golden alexanders	*Zizia aurea*	0.21	0.24	1.68%	0.85
purple prairie clover	*Dalea purpurea*	0.10	0.11	0.80%	0.55
hoary vervain	*Verbena stricta*	0.10	0.11	0.78%	1.00
narrow-leaved purple coneflower	*Echinacea angustifolia*	0.08	0.09	0.62%	0.20
stiff goldenrod	*Oligoneuron rigidum*	0.07	0.08	0.53%	1.00
black-eyed susan	*Rudbeckia hirta*	0.07	0.08	0.52%	2.20
Canada milk vetch	*Astragalus canadensis*	0.06	0.07	0.51%	0.40
white prairie clover	*Dalea candida*	0.06	0.07	0.46%	0.40
Canada tick trefoil	*Desmodium canadense*	0.04	0.04	0.36%	0.09
Early Sunflower	*Heliopsis helianthoides*	0.04	0.04	0.35%	0.10
round-headed bush clover	*Lespedeza capitata*	0.03	0.03	0.27%	0.10
wild bergamot	*Monarda fistulosa*	0.03	0.03	0.24%	0.76
smooth aster	*Symphyotrichum laeve*	0.03	0.03	0.24%	0.60
rough blazing star	*Liatris aspera*	0.02	0.02	0.18%	0.13
dotted blazing star	*Liatris punctata*	0.02	0.02	0.16%	0.05
bracted spiderwort	*Tradescantia bracteata*	0.02	0.02	0.13%	0.06
whorled milkweed	*Asclepias verticillata*	0.01	0.01	0.10%	0.05
heath aster	*Symphyotrichum ericoides*	0.01	0.01	0.10%	0.90
	Forbs Subtotal	1.00	1.12	8.03%	9.44
Oats	*Avena sativa*	4.25	4.76	34.04%	1.90
	Cover Crop Subtotal	4.25	4.76	34.04%	1.90
	Total	12.50	14.01	100.00%	74.57
Purpose:	Regional dry prairie reconstruction for wetland mitigation, ecological restoration, or conservation program plantings.				
Planting Area:	North-Central Glaciated Plains Section. Mn/DOT Districts 3A(southwest) 3B, 4(south), 7 & 8.				

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35-541 **Mesic Prairie Southwest**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
little bluestem	*Schizachyrium scoparium*	1.50	1.68	12.50%	8.27
Indian grass	*Sorghastrum nutans*	1.50	1.68	12.54%	6.63
big bluestem	*Andropogon gerardii*	0.90	1.01	7.49%	3.30
side-oats grama	*Bouteloua curtipendula*	0.90	1.01	7.49%	1.98
nodding wild rye	*Elymus canadensis*	0.90	1.01	7.46%	1.71
slender wheatgrass	*Elymus trachycaulus*	0.90	1.01	7.46%	2.27
western wheatgrass	*Pascopyrum smithii*	0.50	0.56	4.15%	1.30
green needle grass	*Nassella viridula*	0.44	0.49	3.67%	1.70
switchgrass	*Panicum virgatum*	0.16	0.18	1.30%	0.80
	Grasses Subtotal	7.70	8.63	64.06%	27.96
golden alexanders	*Zizia aurea*	0.25	0.28	2.06%	1.00
partridge pea	*Chamaecrista fasciculata*	0.10	0.11	0.84%	0.10
narrow-leaved purple coneflower	*Echinacea angustifolia*	0.08	0.09	0.65%	0.20
purple prairie clover	*Dalea purpurea*	0.07	0.08	0.61%	0.40
gray-headed coneflower	*Ratibida pinnata*	0.07	0.08	0.61%	0.80
blue vervain	*Verbena hastata*	0.07	0.08	0.61%	2.50
Canada milk vetch	*Astragalus canadensis*	0.06	0.07	0.53%	0.40
Early Sunflower	*Heliopsis helianthoides*	0.06	0.07	0.50%	0.14
black-eyed susan	*Rudbeckia hirta*	0.06	0.07	0.49%	2.00
Canada tick trefoil	*Desmodium canadense*	0.05	0.06	0.45%	0.11
hoary vervain	*Verbena stricta*	0.05	0.06	0.41%	0.50
wild bergamot	*Monarda fistulosa*	0.04	0.04	0.29%	0.90
white prairie clover	*Dalea candida*	0.03	0.03	0.24%	0.20
rough blazing star	*Liatris aspera*	0.03	0.03	0.28%	0.20
stiff goldenrod	*Oligoneuron rigidum*	0.03	0.03	0.28%	0.50
smooth aster	*Symphyotrichum laeve*	0.03	0.03	0.25%	0.60
great blazing star	*Liatris pycnostachya*	0.02	0.02	0.21%	0.10
	Forbs Subtotal	1.10	1.23	9.31%	10.65
Oats	*Avena sativa*	3.20	3.59	26.63%	1.42
	Cover Crop Subtotal	3.20	3.59	26.63%	1.42
	Total	12.00	13.45	100.00%	40.03
Purpose:	Regional mesic prairie reconstruction for wetland mitigation, ecological restoration, or conservation program plantings.				
Planting Area:	North-Central Glaciated Plains Section. Mn/DOT Districts 3A(southwest) 3B, 4(south), 7 & 8.				

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35-621 **Dry Prairie Southeast**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
little bluestem	*Schizachyrium scoparium*	1.51	1.69	13.70%	8.30
nodding wild rye	*Elymus canadensis*	1.50	1.68	13.61%	2.86
slender wheatgrass	*Elymus trachycaulus*	1.18	1.32	10.76%	3.00
side-oats grama	*Bouteloua curtipendula*	1.13	1.27	10.23%	2.48
blue grama	*Bouteloua gracilis*	0.68	0.76	6.19%	10.00
junegrass	*Koeleria macrantha*	0.41	0.46	3.71%	30.00
kalm's brome	*Bromus kalmii*	0.31	0.35	2.78%	0.90
prairie dropseed	*Sporobolus heterolepis*	0.26	0.29	2.32%	1.50
sand dropseed	*Sporobolus cryptandrus*	0.22	0.25	1.98%	16.00
	Grasses Subtotal	7.20	8.07	65.28%	75.04
purple prairie clover	*Dalea purpurea*	0.15	0.17	1.32%	0.80
white prairie clover	*Dalea candida*	0.09	0.10	0.78%	0.60
black-eyed susan	*Rudbeckia hirta*	0.09	0.10	0.86%	3.20
butterfly milkweed	*Asclepias tuberosa*	0.06	0.07	0.52%	0.09
Early Sunflower	*Heliopsis helianthoides*	0.06	0.07	0.51%	0.13
stiff goldenrod	*Oligoneuron rigidum*	0.06	0.07	0.59%	0.98
bird's foot coreopsis	*Coreopsis palmata*	0.05	0.06	0.50%	0.20
large-flowered beard tongue	*Penstemon grandiflorus*	0.04	0.04	0.35%	0.20
round-headed bush clover	*Lespedeza capitata*	0.03	0.03	0.31%	0.10
wild bergamot	*Monarda fistulosa*	0.03	0.03	0.30%	0.85
rough blazing star	*Liatris aspera*	0.02	0.02	0.17%	0.11
dotted blazing star	*Liatris punctata*	0.02	0.02	0.23%	0.06
horsemint	*Monarda punctata*	0.02	0.02	0.22%	0.80
silky aster	*Symphyotrichum sericeum*	0.02	0.02	0.19%	0.20
heart-leaved alexanders	*Zizia aptera*	0.02	0.02	0.21%	0.10
whorled milkweed	*Asclepias verticillata*	0.01	0.01	0.11%	0.05
gray goldenrod	*solidago nemoralis*	0.01	0.01	0.14%	1.65
skyblue aster	*Symphyotrichum oolentangiense*	0.01	0.01	0.06%	0.20
bracted spiderwort	*Tradescantia bracteata*	0.01	0.01	0.12%	0.05
	Forbs Subtotal	0.80	0.90	7.49%	10.37
Oats	*Avena sativa*	3.00	3.36	27.23%	1.33
	Cover Crop Subtotal	3.00	3.36	27.23%	1.33
	Total	11.00	12.33	100.00%	86.75
Purpose:	Regional dry prairie reconstruction for wetland mitigation, ecological restoration, or conservation program plantings.				
Planting Area:	Eastern Broadleaf Forest Province excluding Hardwood Hills subsection. Mn/DOT Districts Metro & 6.				

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35-641 **Mesic Prairie Southeast**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
Indian grass	*Sorghastrum nutans*	2.00	2.24	16.68%	8.82
side-oats grama	*Bouteloua curtipendula*	1.37	1.54	11.38%	3.01
little bluestem	*Schizachyrium scoparium*	1.27	1.42	10.59%	7.00
nodding wild rye	*Elymus canadensis*	1.05	1.18	8.77%	2.01
big bluestem	*Andropogon gerardii*	0.90	1.01	7.49%	3.30
slender wheatgrass	*Elymus trachycaulus*	0.90	1.01	7.50%	2.28
switchgrass	*Panicum virgatum*	0.21	0.24	1.78%	1.10
	Grasses Subtotal	7.70	8.63	64.19%	27.52
partridge pea	*Chamaecrista fasciculata*	0.60	0.67	5.00%	0.60
Canada milk vetch	*Astragalus canadensis*	0.16	0.18	1.33%	1.00
Canada tick trefoil	*Desmodium canadense*	0.15	0.17	1.24%	0.30
hoary vervain	*Verbena stricta*	0.10	0.11	0.85%	1.05
purple prairie clover	*Dalea purpurea*	0.09	0.10	0.76%	0.50
golden alexanders	*Zizia aurea*	0.07	0.08	0.60%	0.29
butterfly milkweed	*Asclepias tuberosa*	0.06	0.07	0.53%	0.10
Early Sunflower	*Heliopsis helianthoides*	0.05	0.06	0.43%	0.12
black-eyed susan	*Rudbeckia hirta*	0.05	0.06	0.38%	1.54
smooth aster	*Symphyotrichum laeve*	0.05	0.06	0.41%	1.00
bracted spiderwort	*Tradescantia bracteata*	0.04	0.04	0.34%	0.15
blue vervain	*Verbena hastata*	0.04	0.04	0.37%	1.50
rough blazing star	*Liatris aspera*	0.03	0.03	0.21%	0.15
great blazing star	*Liatris pycnostachya*	0.03	0.03	0.29%	0.14
stiff goldenrod	*Oligoneuron rigidum*	0.02	0.02	0.17%	0.31
gray-headed coneflower	*Ratibida pinnata*	0.02	0.02	0.15%	0.20
whorled milkweed	*Asclepias verticillata*	0.01	0.01	0.10%	0.05
white prairie clover	*Dalea candida*	0.01	0.01	0.07%	0.06
wild bergamot	*Monarda fistulosa*	0.01	0.01	0.06%	0.18
heath aster	*Symphyotrichum ericoides*	0.01	0.01	0.05%	0.40
	Forbs Subtotal	1.60	1.79	13.34%	9.64
Oats	*Avena sativa*	2.70	3.03	22.47%	1.20
	Cover Crop Subtotal	2.70	3.03	22.47%	1.20
	Total	12.00	13.45	100.00%	38.36
Purpose:	Regional mesic prairie reconstruction for wetland mitigation, ecological restoration, or conservation program plantings.				
Planting Area:	Eastern Broadleaf Forest Province excluding Hardwood Hills subsection. Mn/DOT Districts Metro & 6.				

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36-211 **Woodland Edge South & West**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
kalm's brome	*Bromus kalmii*	1.50	1.68	4.34%	4.40
nodding wild rye	*Elymus canadensis*	1.25	1.40	3.61%	2.38
slender wheatgrass	*Elymus trachycaulus*	1.25	1.40	3.64%	3.18
big bluestem	*Andropogon gerardii*	1.00	1.12	2.90%	3.68
side-oats grama	*Bouteloua curtipendula*	1.00	1.12	2.89%	2.20
Indian grass	*Sorghastrum nutans*	1.00	1.12	2.89%	4.40
little bluestem	*Schizachyrium scoparium*	0.62	0.69	1.79%	3.40
bottlebrush grass	*Elymus hystrix*	0.32	0.36	0.91%	0.88
switchgrass	*Panicum virgatum*	0.06	0.07	0.17%	0.30
	Grasses Subtotal	8.00	8.97	23.14%	24.82
black-eyed susan	*Rudbeckia hirta*	0.18	0.20	0.52%	6.10
American vetch	*Vicia americana*	0.18	0.20	0.52%	0.14
white prairie clover	*Dalea candida*	0.17	0.19	0.50%	1.20
Canada tick trefoil	*Desmodium canadense*	0.14	0.16	0.42%	0.29
Early Sunflower	*Heliopsis helianthoides*	0.13	0.15	0.38%	0.30
golden alexanders	*Zizia aurea*	0.11	0.12	0.33%	0.46
blue giant hyssop	*Agastache foeniculum*	0.10	0.11	0.28%	3.20
wild bergamot	*Monarda fistulosa*	0.06	0.07	0.18%	1.60
stiff goldenrod	*Oligoneuron rigidum*	0.06	0.07	0.17%	0.90
Clayton's sweet cicely	*Osmorhiza claytonii*	0.06	0.07	0.17%	0.06
smooth wild rose	*Rosa blanda*	0.06	0.07	0.17%	0.06
showy goldenrod	*Solidago speciosa*	0.06	0.07	0.18%	1.80
smooth aster	*Symphyotrichum laeve*	0.06	0.07	0.19%	1.30
Lance-leaved Figwort	*Scrophularia lanceolata*	0.05	0.06	0.14%	3.20
common yarrow	*Achillea millefolium*	0.03	0.03	0.09%	2.00
white snakeroot	*Ageratina altissima*	0.03	0.03	0.09%	1.70
zigzag goldenrod	*Solidago flexicaulis*	0.02	0.02	0.05%	0.50
	Forbs Subtotal	1.50	1.68	4.38%	24.80
Oats	*Avena sativa*	25.00	28.02	72.48%	11.14
	Cover Crop Subtotal	25.00	28.02	72.48%	11.14
	Total	34.50	38.67	100.00%	60.75
Purpose:	Partly shaded grassland planting for native roadsides, reclamation, etc.				
Planting Area:	Tallgrass Aspen Parklands, Prairie Parkland, and Eastern Broadleaf Forest Provinces. Mn/DOT Districts 2(west), 3B, 4, Metro, 6, 7 & 8.				

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36-311 **Woodland Edge Northeast**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
fringed brome	*Bromus ciliatus*	2.00	2.24	5.98%	8.10
slender wheatgrass	*Elymus trachycaulus*	2.00	2.24	5.96%	5.06
nodding wild rye	*Elymus canadensis*	1.25	1.40	3.72%	2.38
fowl bluegrass	*Poa palustris*	0.87	0.98	2.59%	41.50
poverty grass	*Danthonia spicata*	0.50	0.56	1.50%	4.60
False Melic	*Schizachne purpurascens*	0.25	0.28	0.75%	2.90
bluejoint	*Calamagrostis canadensis*	0.13	0.15	0.37%	12.90
	Grasses Subtotal	7.00	7.85	20.87%	77.44
American vetch	*Vicia americana*	0.50	0.56	1.50%	0.38
black-eyed susan	*Rudbeckia hirta*	0.26	0.29	0.77%	8.70
smooth wild rose	*Rosa blanda*	0.16	0.18	0.47%	0.15
stiff goldenrod	*Oligoneuron rigidum*	0.14	0.16	0.42%	2.10
smooth aster	*Symphyotrichum laeve*	0.14	0.16	0.43%	2.90
tall cinquefoil	*Drymocallis arguta*	0.06	0.07	0.19%	5.30
gray goldenrod	*Solidago nemoralis*	0.06	0.07	0.18%	6.80
flat-topped aster	*Doellingeria umbellata*	0.04	0.04	0.12%	1.00
upland white aster	*Solidago ptarmicoides*	0.04	0.04	0.13%	1.00
common yarrow	*Achillea millefolium*	0.03	0.03	0.09%	2.00
Lindley's Aster	*Symphyotrichum ciliolatum*	0.03	0.03	0.10%	1.00
pearly everlasting	*Anaphalis margaritacea*	0.02	0.02	0.05%	1.30
large-leaved aster	*Eurybia macrophylla*	0.02	0.02	0.05%	0.18
	Forbs Subtotal	1.50	1.68	4.50%	32.81
Oats	*Avena sativa*	25.00	28.02	74.63%	11.14
	Cover Crop Subtotal	25.00	28.02	74.63%	11.14
	Total	33.50	37.55	100.00%	121.39
Purpose:	Partly shaded grassland planting for native roadsides, reclamation, etc in north-central and northeast MN				
Planting Area:	Laurentian Mixed Forest Province excluding Chippewa Plains, Pine Moraines & Outwash Plains, and Mille Lacs Uplands subsections. Mn/DOT Districts 1 & 2(east).				

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36-411 **Woodland Edge Northwest**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
kalm's brome	*Bromus kalmii*	2.00	2.24	5.64%	5.88
Virginia wild rye	*Elymus virginicus*	1.75	1.96	4.93%	2.70
side-oats grama	*Bouteloua curtipendula*	1.00	1.12	2.81%	2.20
nodding wild rye	*Elymus canadensis*	1.00	1.12	2.81%	1.91
slender wheatgrass	*Elymus trachycaulus*	1.00	1.12	2.81%	2.53
fringed brome	*Bromus ciliatus*	0.75	0.84	2.12%	3.04
big bluestem	*Andropogon gerardii*	0.50	0.56	1.42%	1.85
Indian grass	*Sorghastrum nutans*	0.50	0.56	1.40%	2.19
poverty grass	*Danthonia spicata*	0.38	0.43	1.06%	3.46
bluejoint	*Calamagrostis canadensis*	0.06	0.07	0.18%	6.40
little bluestem	*Schizachyrium scoparium*	0.06	0.07	0.18%	0.35
	Grasses Subtotal	9.00	10.09	25.36%	32.50
black-eyed susan	*Rudbeckia hirta*	0.31	0.35	0.86%	10.35
purple prairie clover	*Dalea purpurea*	0.18	0.20	0.51%	1.00
tall meadow-rue	*Thalictrum dasycarpum*	0.13	0.15	0.35%	0.92
American vetch	*Vicia americana*	0.13	0.15	0.37%	0.10
golden alexanders	*Zizia aurea*	0.13	0.15	0.36%	0.51
blue giant hyssop	*Agastache foeniculum*	0.12	0.13	0.35%	4.10
smooth wild rose	*Rosa blanda*	0.10	0.11	0.28%	0.10
white prairie clover	*Dalea candida*	0.06	0.07	0.16%	0.40
stiff goldenrod	*Oligoneuron rigidum*	0.06	0.07	0.17%	0.91
upland white aster	*Solidago ptarmicoides*	0.06	0.07	0.16%	1.30
Early Sunflower	*Heliopsis helianthoides*	0.04	0.04	0.12%	0.10
common yarrow	*Achillea millefolium*	0.03	0.03	0.09%	2.00
lead plant	*Amorpha canescens*	0.03	0.03	0.09%	0.15
Tall Thimbleweed	*Anemone virginiana*	0.03	0.03	0.08%	0.30
columbine	*Aquilegia canadensis*	0.03	0.03	0.08%	0.40
prairie sage	*Artemisia ludoviciana*	0.03	0.03	0.09%	2.90
flat-topped aster	*Doellingeria umbellata*	0.03	0.03	0.09%	0.80
	Forbs Subtotal	1.50	1.68	4.21%	26.33
Oats	*Avena sativa*	25.00	28.02	70.43%	11.14
	Cover Crop Subtotal	25.00	28.02	70.43%	11.14
	Total	35.50	39.79	100.00%	69.96
Purpose:	Partly shaded grassland planting for native roadsides, reclamation, etc.				
Planting Area:	Tallgrass Aspen Parklands Province. Mn/DOT District 2(west).				

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36-711 **Woodland Edge Central**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
Virginia wild rye	*Elymus virginicus*	1.75	1.96	4.93%	2.70
kalm's brome	*Bromus kalmii*	1.50	1.68	4.22%	4.40
little bluestem	*Schizachyrium scoparium*	1.13	1.27	3.17%	6.20
side-oats grama	*Bouteloua curtipendula*	1.00	1.12	2.81%	2.20
slender wheatgrass	*Elymus trachycaulus*	1.00	1.12	2.81%	2.53
nodding wild rye	*Elymus canadensis*	0.75	0.84	2.11%	1.43
big bluestem	*Andropogon gerardii*	0.50	0.56	1.42%	1.85
fringed brome	*Bromus ciliatus*	0.50	0.56	1.39%	2.00
Indian grass	*Sorghastrum nutans*	0.50	0.56	1.41%	2.20
poverty grass	*Danthonia spicata*	0.37	0.41	1.04%	3.40
	Grasses Subtotal	9.00	10.09	25.31%	28.91
Canada milk vetch	*Astragalus canadensis*	0.25	0.28	0.71%	1.58
black-eyed susan	*Rudbeckia hirta*	0.20	0.22	0.57%	6.80
purple prairie clover	*Dalea purpurea*	0.18	0.20	0.51%	1.00
Early Sunflower	*Heliopsis helianthoides*	0.13	0.15	0.37%	0.30
smooth wild rose	*Rosa blanda*	0.09	0.10	0.27%	0.09
round-headed bush clover	*Lespedeza capitata*	0.07	0.08	0.19%	0.20
blue giant hyssop	*Agastache foeniculum*	0.06	0.07	0.18%	2.10
white prairie clover	*Dalea candida*	0.06	0.07	0.16%	0.40
wild bergamot	*Monarda fistulosa*	0.06	0.07	0.18%	1.60
Clayton's sweet cicely	*Osmorhiza claytonii*	0.06	0.07	0.17%	0.06
showy goldenrod	*Solidago speciosa*	0.06	0.07	0.17%	1.80
smooth aster	*Symphyotrichum laeve*	0.06	0.07	0.18%	1.30
skyblue aster	*Symphyotrichum oolentangiense*	0.06	0.07	0.17%	1.80
golden alexanders	*Zizia aurea*	0.06	0.07	0.16%	0.23
lead plant	*Amorpha canescens*	0.05	0.06	0.13%	0.21
common yarrow	*Achillea millefolium*	0.03	0.03	0.09%	2.00
pearly everlasting	*Anaphalis margaritacea*	0.02	0.02	0.05%	1.30
	Forbs Subtotal	1.50	1.68	4.26%	22.77
Oats	*Avena sativa*	25.00	28.02	70.43%	11.14
	Cover Crop Subtotal	25.00	28.02	70.43%	11.14
	Total	35.50	39.79	100.00%	62.81
Purpose:	Partly shaded grassland planting for native roadsides, reclamation, etc.				
Planting Area:	Chippewa Plains, Pine Moraines & Outwash Plains, and Mille Lacs Uplands subsections. Mn/DOT Districts 2(southeast) & 3A.				

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Establishing Non-Native Seed Mixtures

General Recommendations

Seeding general mixtures can be accomplished using a number of different methods from mechanical means to hydroseeding. One key to a successful establishment is preparing the soil bed. Immediately before seeding, the soil should be tilled to a minimum depth of 3". The tillage will help improve seed-to-soil contact as well as increase the amount of initial infiltration giving the seeds moisture to begin establishment. **+**

Temporary Erosion Control

Immediately after seeding, within 24 hours, mulch should be applied to protect and enhance seed germination. In most cases on slopes 1:3 (Vertical:Horizontal) and flatter Mn/DOT Type 1 mulch (see specification below) at 90% soil coverage is applied. This generally requires about 2 tons per acre of straw mulch. If mulch applications are placed too heavily, it can hinder germination or smother new seedlings. In areas with weed concerns, it is recommended to use high quality weed free mulch such as MCIA Certified Weed Free mulch, Mn/DOT Type 3. See Native Grass section for example Mn/DOT Type 3 specification.

On slopes that are temporary in nature, have limited access, or are stockpiles, consider using Mn/DOT Type 6 Hydraulic Soil Stabilizer (see specification below) at 2100 lbs/acre.

On slopes that are steeper than 1:3 or in ditch bottoms it is recommended that the seeding be covered with an erosion control blanket. The erosion control blanket should contain netting on both sides and be composed of straw, a straw/coconut blend, or wood fibers. Under more strenuous conditions such as slopes steeper than 1:2, ditch bottoms experiencing flow velocities greater than 7 feet/second or ditch grades 5% or more specialized treatments not covered in this manual should be used.

Generic Specification Examples:

Mn/DOT Type 1 Mulch – This mulch shall consist of grain straw, hay, cuttings of agricultural grasses and legumes. The material shall be free of seed bearing stalks of noxious grasses or weeds as defined by the rules and regulations of the Minnesota Department of Agriculture. In addition, mulch shall not contain the following species: cattail, reed canary grass, birds-foot trefoil or crown vetch. At the time of delivery the mulch shall be in an air-dried condition.

Mn/DOT Type 6 Hydraulic Soil Stabilizer – Type 6 shall be a blend of 40 to 60% recycled paper and 40 to 60% wood cellulose fibers by weight. The fibers shall contain no germination or growth inhibiting factors. It shall not contain nor be processed from sawdust or pulverized newspaper. It shall be dyed an appropriate color to allow visual metering of its application, and shall have the property of becoming dispersed and suspended when agitated in water. It shall contain 2.5 to 5% tackifier by weight. The tackifier shall be incidental to the Type 6 hydromulch material. When sprayed uniformly on the surface of the soil, the fibers shall form a blotter-like ground cover that readily absorbs water and allows infiltration to the underlying soil. Moisture content shall not exceed 15% at the time of delivery. When washed on a 850µm sieve at least 50% shall be retained on the sieve.

Fertilizer

Fertilizer is based on 3 main ingredients as a percentage of the bag plus minerals and inert material making up the remainder. These 3 ingredients are Nitrogen (N), Phosphorus (P), and Potassium (K) and are shown as an N:P:K ratio. This ratio is also known as the fertilizer analysis. It is always recommended to take soil tests to determine the existing soil fertility in order to choose an appropriate fertilizer analysis based on the soil deficiencies. Depending on the site and the situation fertilizer selection can be one of four types; Type 1: a Commercial fertilizer, Type 2: a Phosphorous Free fertilizer, Type 3: a Slow Release Nitrogen fertilizer, and Type 4: a Natural Based fertilizer from organic material. The fertilizer type chosen will depend on the site, proximity to ditches, surface waters…

Immediately before seeding, broadcast and work into the top inch of soil the fertilizer at the appropriate application rate, then seed. Prior to mulching firm up the seed bed with a cultipacker or other approved soil firming equipment.

Seeding Methods

Method 1. Drop Seeding Onto Tilled Sites
This is the "standard" method for seeding on prepared sites such as those on construction projects.

A) Site Preparation - The site should be prepared by loosening topsoil to a minimum depth of 3 inches.
B) Fertilizer – Use a fertilizer analysis based on a soil test or a general recommendation is a 10-10-10 (NPK) commercial grade analysis at 200 lbs/acre.
C) Seed Installation - Seed should be installed with a drop seeder that will accurately meter the types of seed to be planted, keep all seeds uniformly mixed during the seeding and contain drop seed tubes for seed placement (Brillion-type). The drop seeder should be equipped with a cultipacker assembly to ensure seed-to-soil contact.
D) Seeding Rates - Rates are specified in the mixture tabulation for the specified mix.
E) Packing – If the drop seeder is not equipped with a cultipacker, the site should be cultipacked following the seeding to ensure seed-to-soil contact.
F) Mulch - The site should be mulched and disc-anchored following cultipacking. The standard mulch is Mn/DOT Type 1 at a rate of 2.0 tons/acre. Also see temporary erosion control for additional information.

Method 2. Hydroseeding
Hydroseeding is an acceptable method for establishing the general mixtures when it is done correctly. However, it is imperative that the site is prepared and finished properly. Mn/DOT generally uses hydroseeding on steep slopes or other areas inaccessible to a drop seeder such as wetland edges and ponds. Hydroseeding is not recommended if the extended weather patterns are hot and dry and the soil surface is dry and dusty. The seed-water slurry should be applied within one hour after the seed is added to the hydroseeder tank.

A) Site Preparation - The site should be prepared by loosening topsoil to a minimum depth of 3 inches. It is critical that the seedbed be loosened to a point that there are a lot of spaces for seed to filter into cracks and crevices otherwise it may end up on the surface and wash away with the first heavy rain.
B) Fertilizer - Either use a fertilizer analysis based on a soil test or a general recommendation is a 10-10-10 (NPK) commercial grade analysis at 300 lbs/acre. 14

C) Seed Installation - Seed should be installed by hydro-seeding it evenly over the entire site. A fan-type nozzle should be used with approximately 500 gallons of water per acre. It is recommended to add approximately 75 pounds of hydromulch per 500 gallons of water for a visual tracer to ensure uniform coverage.
D) Seeding Rates - Rates are specified in the mixture tabulation for the specified mix.
E) Harrowing - The site should be harrowed, cultipacked or raked following seeding.
F) Mulch - The site should be mulched following harrowing using one of the following methods (as per plans or special provisions):
- Mn/DOT Type 1 mulch at a rate of 2.0 tons per acre with disc anchoring.
- Mn/DOT Hydraulic Soil Stabilizer or Bonded Fiber Matrix on inaccessible sites.

NOTE: When seeding in conjunction with a hydraulic soil stabilizer (bonded fiber matrixes (BFM's), hydro-mulches, etc., it is recommended that a two-step operation be used. Seed should be placed first and the hydraulic soil stabilizer be applied afterwards. This is to ensure that seed comes into direct contact with the soil.

Method 3. Broadcast Seeding
Broadcast seeding is performed either with mechanical "cyclone" seeders, by hand seeding or by any other method that scatters seed over the soil surface. It is essential that steps be taken to ensure good seed to soil contact when broadcast seeding is used.

A) Site Preparation - The site should be prepared by loosening topsoil to a minimum depth of 3 inches. It is critical that the seedbed be loosened to a point that there are spaces for seed to filter into cracks and crevices otherwise it may end up on the surface and wash away with the first heavy rain.
B) Fertilizer - Use a fertilizer analysis based on a soil test or a general recommendation is a 10-10-10 (NPK) commercial grade analysis at 200 lbs/acre.

C) Seed Installation - Seed should be installed by broadcasting it evenly over the entire site. Several types and sizes of broadcast seeders are available for use, ranging from fertilizer-type spreaders to power spreaders mounted on all terrain vehicles. Seed should be mixed thoroughly prior to seeding and should be mixed occasionally in the spreader to prevent separation and settling.

D) Seeding Rates - Rates are specified in the mixture tabulation for the specified mix.

E) Harrowing - The site should be harrowed or raked following seeding.

F) Packing - The site should be cultipacked following harrowing.

G) Mulch - The site should be mulched following packing using one of the following types of mulch (as per plans or special provisions):

- Mn/DOT Type 1 mulch at a rate of 2.0 tons per acre followed by disc anchoring.
- Mn/DOT Hydraulic Soil Stabilizer or Bonded Fiber Matrix on inaccessible sites.

Method 4. Interseeding Into Existing Vegetation or Mulch

This method is generally used for sites that did not establish well or if a temporary mulch was applied to the site. An interseeder drill can be used to plant the seed without removing or tilling the existing vegetation or mulch.

A) Site Preparation For Existing Vegetation- The site should be prepared by mowing existing vegetation to a height of 4-6 inches. The area can then be directly planted using an interseeding drill. NOTE: Sites that contain significant weed infestations may require weed control measures before planting. After mowing, a herbicide application with glyphosate should be used. Addition of a surfactant and/or addition of 2,4-D to the mix often results in a more complete kill, especially with unwanted broad-leaved species. Recommended herbicide rates are 2.0 quarts/acre of glyphosate and 1.0 - 2.0 quarts/acre 2,4-D. Seeding can be performed 7-10 days after herbicide application. Other broadleaf herbicides can also be used such as Trimec, Transline, Stinger, etc. Follow the label directions.

B) Fertilizer - Use a fertilizer analysis based on a soil test or a general recommendation is a 22-5-10 (NPK) commercial grade analysis at 200 lbs/acre.

C) Seed Installation - The seed mixture should be installed with a seed drill that will accurately meter the seed to be planted and keep all seeds uniformly mixed during the drilling. The drill should contain a legume box for small seeds, and it should be equipped with disc furrow openers and packer assembly to compact the soil directly over the drill rows. Maximum row spacing should be 8 inches. The inter-seeder drill must be out-fitted with trash rippers that will slice through the vegetative mat and make a furrow into the underlying soil approximately 1 inch wide by 1/2 to 1 inch deep. These furrows shall be directly in line with the drill seed disc openers. Fine seed should be drop-seeded onto the ground surface from the fine seed box drill seeding should be done whenever possible at a right angle to surface drainage.

D) Seeding Rates - Rates are specified in the mixture tabulation for the specified mix.

E) Harrowing - Harrowing is not required when using this seeding method.

F) Packing - Cultipacking the site is recommended to ensure seed-to-soil contact.

G) Mulch - Mulch is not required when using this seeding method unless a 90% soil coverage rate is not maintained.

Establishing Native Grasses and Forbs

General Recommendations

Seeding should take place soon after any final grading, contouring or other major site work is completed to minimize soil erosion and invasion by weedy species. Consequently, this work should be done just before the time of year when the seeds should be planted. Seeding natives can be done with good results in the spring or fall. If seeding over dead vegetation, the best results are in the fall, the freeze/thaw cycle will allow better seed to soil contact. Fall seeding allows stratification for the seeds that may need to over winter to germinate. Seeding native grasses and forbs (wildflowers) can be accomplished using a number of different methods. However, due to the complexity of seed sizes, textures and densities, a great deal of care needs to be taken to ensure that the site is well prepared and that seed is placed properly. A number of different types of drills may be used to place seed, but be aware that many “older style” drills will clog easily with fluffy seeds. Some drills will not distribute the seed evenly due to the varying size and weight of the seed. Broadcast seeding and hydroseeding also work well,

but remember that natives cannot be seeded exactly the same as turf grasses. There are several general "rules of thumb" to keep in mind when seeding natives:

- Native seeds prefer a firm seedbed. An overly soft seedbed risks the chance of seeds being planted too deep.
- Large and/or fluffy seeds should be buried approximately 1/4 inch deep.
  - Seed should be lightly covered with soil. Harrowing or raking works well.
- Small and/or fine seeds (most forbs) should be scattered over the soil surface.

Native Grass and Forb Mixtures
Seed mixtures beginning with the number 3 are native mixtures andconsist of warm-season native grasses, cool-season native grasses, native forbs (wildflowers) and annual or short-term cover crops to provide increased erosion protection. A deliberate attempt has been made to have a large number of different grasses and forbs as it has been shown that diverse plantings are more resistant to drought, floods, and pathogens than monotypic or low diversity plantings. The inclusion of a diverse mixture of forbs is greatly beneficial to wildlife and the forbs occupy niches that would otherwise be occupied by weeds such as thistle. The native legumes also fix nitrogen, which is made available to other plants in the system through fungal interactions between plants. Cool-season native grasses tend to establish quickly and will decrease over time on sites where warm-season species would normally dominate. Warm-season native grasses tend to be slower to establish, but are extremely hardy and long-lived. Warm-season grasses also tend to stay standing over the winter and provide the best snow filtering capabilities and wildlife habitat.

Cover/nurse Crops
– Cover crops provide a quick short-term vegetative cover while the permanent native species are establishing. A cover crop reduces the soils erosion potential and moderates the native seedlings microclimate during establishment. Typical cover crops in Mn/DOT's native mixes include oats/winter wheat, annual rye grass and slender wheatgrass. Winter wheat is substituted for oats during fall plantings. The annual rye grass provides good cover in early spring but does not do well in late spring and summer. It also does well dormant seeded.

Temporary Erosion Control
- It is recommended to protect a new seeding by covering it with mulch or an erosion control blanket. In general, slopes that are 1:3 (vertical : horizontal) and flatter should be mulched with a clean grain straw or native grass mulch and disc anchored following seeding. Mulching should attempt to achieve 90% coverage of the exposed soil surface. This generally requires about 2 tons per acre of straw mulch. It is also recommended to use a high quality weed free mulch such as MCIA Certified Weed Free mulch (see below for specification) or a native grass (prairie) mulch.

On slopes that are steeper than 1:3 it is recommended that the seeding be covered with an erosion control blanket. Generally, straw blankets containing double netting (Straw 2S) perform best with native plantings.

If seeding is being done in a ditch or swale that will receive moderate water flows for periods of time, it is recommended that a straw/coconut blanket be used to cover it. Other more severe situations such as very steep slopes and/or channels exposed to high water velocities will require more specialized treatments that are not covered in this manual.

NOTE: Mulches derived from pasture hay containing reed canary grass, smooth brome and other introduced forage species may contain enough seed of those species to ruin your native grass and forb planting. They are not recommended for use with native plantings.

Generic Specification Example:

> **Mn/DOT Type 3 (MCIA Certified Weed Free Mulch)** - This mulch shall consist of clean grain straw and be certified by the Minnesota Crop Improvement Association (MCIA) to be free of noxious weed seeds, seed bearing stalks, and/or other reproductive propagules as defined by rules and regulations of the Minnesota Department of Agriculture. Documentation verifying that the mulch has passed MCIA field inspection shall accompany the material upon delivery to the job site. At the time of delivery, the mulch shall be in an air dried condition.

Fertilizer
– It is always recommended to take soil tests to determine the existing soil fertility in order to choose an appropriate fertilizer and lime based on the soil deficiencies. Lime and fertilizer suggestions based on soil tests are the same as for cool-season grasses. Lime is not necessary if soil pH is 5.5 or higher. If phosphorous and potassium levels are low it is recommended to use a 0-10-20 NPK analysis slow release fertilizer applying 60 pounds per acre (see below for specification). Nitrogen is not recommended when establishing warm-season grasses because it leads to increased weed competition. However established stands will respond positively to 40 to 60 pounds of N per acre.

Generic Specification Example:

> **Fertilizer (Type 3 - Slow Release)** - The fertilizer used for this project shall be a commercial grade of **slow release complete fertilizer** applied at a rate of 60 lbs/acre at the time of preparing the seed bed for seeding. The fertilizer shall contain a 0-10-20 (NPK) analysis.

Seeding Into Agricultural Fields
- Many fields that have been row cropped will have some amount of herbicide residue present, depending on what the crop was and what type of herbicide was used on the site to control weeds. Leaving the site fallow, or planting a temporary cover for a season before planting, will help reduce herbicide residue. Fields that have been treated with Atrazine in the last two years should be left fallow a season prior to planting.

Inoculants
- A number of inoculants are available in the marketplace. Native legumes form an association with nitrogen fixing bacteria of the genus *Rhizobium*. The *Rhizobial* bacteria occupy nodules on the plant roots. Most legume seed comes with bacterial inoculant in the form of a fine powder. Usually this inoculum is already dead or is not the right species for the native legume and the majority of the nodulation that actually occurs is from *Rhizobia* already present in the soil. Extremely disturbed soils may contain no *Rhizobia* at all. More information on *Rhizobia* is available at the University of Minnesota website: http://www.rhizobium.umn.edu/. Another form of inoculum that is available are various mycorrhizal fungi. Most mycorrhizal inoculants that are available are ecto-mycorrhizae, which are for woody species. The type of mycorrhizae that associate with prairie species are endo-mycorrhizae, specifically vesicular arbuscular mycorrhizae (VA mycorrhizae). To our knowledge, no good commercial sources for VA mycorrhizae are available at this time for prairie species. The soil can be tested to see if there is already mycorrhizae present, whether the soil is toxic or has the proper soil properties to enhance colocization.

Seed Treatments
- Be aware that seeds of many native species require specialized treatments such as cold/moist stratification, scarification, etc. Many of these species go through such treatments naturally if seeded in the fall.

Origin Requirements: It is preferred that seed of all native grasses and forbs be “certified” to be of MN (or regional) origin and of wild ecotype. The origin certification program is administered by the Minnesota Crop Improvement Association (MCIA). Documentation accompanying origin certification should include the “yellow tag” if species are being supplied individually and/or a document from MCIA indicating origin. On labels affixed to bags of seed it is common to show the species, germination, purity, lot number, and under origin “YT” or yellow tag with the geographic origin (i.e., Hennepin Co., MN).

Seed Texture and Size
Seed texture and size of native seed is highly variable. Some native seed such as Switchgrass is very small while other native seed such as Canada Wild rye has long awns.

If a drill or drop seeder is used, the seed mixture ingredients should be ordered such that the seed is packaged separately based seed size and texture. Fluffy seed should be placed in the native seed box that contains picker fingers. Fine seed should be placed in the fine seed box. Cereal grains, such as oats and winter wheat, used for a cover crop should be placed in the grain seed box that contains flutes.

If a broadcast seeder is used, the seed mixture may either be ordered mixed or as separate ingredients. During installation, the operator should be aware that fluffy seed will have a tendency to bridge or "ball up" in the seeder. Fine seed has a tendency to "pour through" the seeder. Therefore, an effective agitator is required in the seed box. Mixing heavier seed such as sideoats grama, wheat and oats will also help "weigh down" the lighter fluffy seed.

If a hydroseeder is used, the seed is usually ordered as a mixture. The hydroseeder has a vigorous agitator in the tank.

Seeding Methods

Method 1. Drop Seeding Onto Tilled Sites
This is the "standard" method for seeding native species on prepared sites such as those on construction projects.

A) Site Preparation – The site should be prepared by loosening topsoil to a minimum depth of 3 inches.
B) Fertilizer – If not basing the fertilizer application on soil test results, the fertilizer used should be a commercial grade slow release complete fertilizer applied at a rate of 300 lbs/acre at the time of preparing the seed bed for seeding. The fertilizer should contain 10-20-20 (NPK) analysis.
C) Seed Installation – Seed should be installed with a drop seeder that will accurately meter the types of seed to be planted and keep all seeds uniformly mixed during planting (Trillion-type). The seeder should contain a minimum of three seed boxes; a fine seed box, a box for large/fluffy seeds, and a box for cool season or grains. It should be equipped with drop tubes and a packer assembly to compact the soil directly over the seed. All seeding should be done at a right angle to surface drainage.
D) Seeding Rates – Rates are specified in the mixture tabulation for the specified mix.
E) Harrowing – The site should be lightly harrowed or raked following seeding if the seeder does not contain a cultipacker.
F) Packing – Cultiacking the site following harrowing is recommended to ensure a firm seed bed.
G) Mulch – The site should be mulched and disc-anchored following packing using one of the following types of mulch (as per plans or special provisions):

- Mn/DOT Type 3 (MCIA certified weed free mulch) at a rate of 2.0 tons per acre.
- Prairie hay/mulch (Mn/DOT Type 7 or 8) at a rate of 2.0 tons per acre.

Method 2. Drill Seeding Into Temporary Cover Crops
This method involves two separate seeding operations. First, a temporary cover crop is planted on the entire site to stabilize the soil and control erosion. Second, the native seed mixture is installed the following fall or the next spring (during one of the optimum seeding dates) using either an interseeder type drill or by lightly disking down the temporary cover and seeding into it. The interseed method greatly reduces the erosion potential and reduces soil disturbance. Using this method allows for some early weed control before the native mixture is installed. This method is used for various reasons such as when a site is ready for seeding at a time of year that is not optimum for seeding a permanent seed mixture, the soils need to be stabilized rapidly for erosion control, or a field needs to be left fallow due to residual herbicide.

I. Establishment of Temporary Cover Crop

A) Site Preparation – The new site should be prepared for the temporary seeding by loosening topsoil to a minimum depth of 3 inches.
B) Fertilizer – The fertilizer used should be a commercial grade of slow release complete fertilizer applied at a rate of 300 lbs/acre at the time of preparing the seed bed for seeding. The fertilizer should contain 10-20-20 (NPK) analysis
C) Seed Installation – Temporary cover crops of oats, winter wheat, or combinations of the above may be installed using a standard grain drill or broadcast. Planting depth should be 1/4 to 1/2 inch.
D) Seeding Rates – The temporary cover crop of oats or winter wheat should be seeded at a rate of 80 lbs/acre.
E) Harrowing – The site should be harrowed or raked following installation of the temporary cover crop.

F) Packing – Packing is not required after installing the temporary cover crop.

G) Mulch – The site should be mulched and disc-anchored following packing using one of the following types of mulch (as per plans or special provisions):

- Mn/DOT Type 3 (MCIA certified weed free mulch) at a rate of 2.0 tons per acre.
- Clean grain straw at a rate of 2 tons per acre.
- Prairie hay/mulch (Mn/DOT Type 7 or 8) at a rate of 2.0 tons per acre.

II. Establishment of the Native Mixture

The native mixture can be established into the areas previously seeded with a temporary cover crop by one of two methods; 1) interseeding using a no-till drill, or 2) by lightly tilling the area with a disc and seeding using one of the other acceptable seeding methods.

A1) Site Preparation for Interseeding - No tillage is necessary for installation of the native seed mixture. The site may require mowing if the temporary cover has grown taller than 12 inches and is still actively growing (winter wheat may require this). This will stop the rapidly growing cover crop from reaching maturity and shading out the establishing native vegetation. Optimal height for existing vegetation to be drilled into is 4-6 inches. No other site preparation is necessary.

A2) Site Preparation with Light Tillage - The area seeded with a temporary cover crop should be prepared by lightly disking to incorporate some of the mulch and temporary cover crop into the soil surface. Approximately 50% of the soil surface should be visible through the mulch or plant debris. Much of the existing cover should be left in place for its mulch value.

B) Fertilizer - The fertilizer used should be a commercial grade of slow release complete fertilizer applied at a rate of 300 lbs/acre at the time of preparing the seed bed for seeding. The fertilizer should contain 10-20-20 (NPK) analysis. The rate is reduced by half the normal recommendation because the initial half of the fertilizer was applied with the cover crop.

C1) Seed Installation By Interseeding - The native seed mixture should be installed with a seed drill that will accurately meter the types of seed to be planted and keep all seeds uniformly mixed during the drilling (Truax-type). The drill should contain a minimum of two seed boxes; a fine seed box and a box for large/fluffy seeds, and it should be equipped with disc furrow openers and packer assembly to compact the soil directly over the drill rows. Maximum row spacing should be 8 inches. The inter-seeder drill must be out-fitted with trash rippers which will slice through the vegetative mat and make a furrow into the underlying soil approximately 1 inch wide by 1/2 to 1 inch deep. These furrows shall be directly in line with the drill seed disc openers. Fine seed can be drop-seeded onto the ground surface from the fine seed box, and large/fluffy seed should be placed to obtain a final planting depth of 1/4 to 1/2 inch. All drill seeding should be done at a right angle to surface drainage.

C2) Seed Installation By Drilling Lightly Tilled Sites - The native mixture should be installed with a seed drill that will accurately meter the types of seed to be planted and keep all seeds uniformly mixed during the drilling (Truax-type). The drill should contain a minimum of two seed boxes; a fine seed box and a box for large/fluffy seeds, and it should be equipped with disc furrow openers and packer assembly to compact the soil directly over the drill rows. Maximum row spacing should be 8 inches. Fine seed should be drop-seeded onto the ground surface from the fine seed box, and large/fluffy seed should be placed to obtain a final planting depth of 1/4 to 1/2 inch. All drill seeding should be done at a right angle to surface drainage.

D) Seeding Rates - Rates are specified in the mixture tabulation for the specified mix. When using the 300 series mixtures, reduce the cover crop component from 70 lbs/acre to 35 lbs/acre.

E) Harrowing - Harrowing is not necessary when seeding the native mixture.

F) Packing - Packing the site is recommended to ensure a firm seed bed.

G) Mulch - Mulch may not be required with installation of the native mixture, depending on existing site conditions. The site should be mulched to achieve 90% ground coverage (10% bare ground). If this condition already exists mulch is not required.

Method 3. Drill Seeding Into Existing Vegetation

This method entails killing the existing vegetation with herbicide and using an interseeder drill to install the seed.

A) Site Preparation - The site should be prepared by mowing existing vegetation to a height of 4-6 inches in

late April/early May or in late August/early September. The grass should be allowed to re-grow or "flush" before herbicide application with glyphosate, this may take 1-3 weeks depending on weather conditions. Addition of a surfactant and/or addition of 2,4-D to the mix often results in a more complete kill, especially with unwanted broad-leaved species. Recommended herbicide rates are 2.0 quarts/acre of glyphosate and 1.0 - 2.0 quarts/acre 2,4-D. Fall site preparation to control smooth brome grass may require higher glyphosate rates. Seeding can be performed 7-10 days after herbicide application. NOTE: Sites that contain significant weed infestations may require other types of weed control during preparation to ensure that the planting is a success.

B) Fertilizer - Fertilizer is not required when using this seeding method.

C) Seed Installation - The native seed mixture should be installed with a seed drill that will accurately meter the types of seed to be planted and keep all seeds uniformly mixed during the drilling (Truax-type). The drill should contain a minimum of two seed boxes; a fine seed box and a box for large/fluffy seeds, and it should be equipped with disc furrow openers and packer assembly to compact the soil directly over the drill rows. Maximum row spacing should be 8 inches. The inter-seeder drill must be out-fitted with trash rippers which will slice through the vegetative mat and make a furrow into the underlying soil approximately 1 inch wide by 1/2 to 1 inch deep. These furrows shall be directly in line with the drill seed disc openers. Fine seed should be drop-seeded onto the ground surface from the fine seed box, and large/fluffy seed should be placed to obtain a final planting depth of 1/4 to 1/2 inch. All drill seeding should be done at a right angle to surface drainage.

D) Seeding Rates - Rates are specified in the mixture tabulation for the specified mix.

E) Harrowing - Harrowing is not required when using this seeding method.

F) Packing - Packing the site is recommended to ensure a firm seed bed.

G) Mulch - Mulch is not required when using this seeding method.

Method 4. Broadcast Seeding

- Broadcast seeding is performed either with mechanical “cyclone” seeders, by hand seeding or by any other method that scatters seed over the bare soil surface. The most desirable aspect of broadcast seeding is that there is no row effect such as that which results from drill seeding. This lends a more natural appearance to the planting. However, broadcast seeding may not be desirable if the weather is hot and dry and/or the soil moisture is content is low. It is essential that steps be taken to ensure good seed to soil contact when broadcast seeding is used.

A) Site Preparation - The site should be prepared by loosening topsoil to a minimum depth of 3 inches. It is critical that the seed bed be loosened to a point that there are spaces for seed to filter into cracks etc., otherwise it may end up on the surface and wash away with the first heavy rain.

B) Fertilizer - If used, the fertilizer used should be a commercial grade of slow release complete fertilizer applied at a rate of 100 lbs/acre at the time of preparing the seed bed for seeding. The fertilizer should contain 0-10-20 (NPK) analysis.

C) Seed Installation - Seed should be installed by broadcasting it evenly over the entire site. Several types and sizes of broadcast seeders are available for use, ranging from fertilizer-type spreaders to power spreaders mounted on all terrain vehicles. Seed should be mixed thoroughly prior to seeding and should be mixed occasionally in the spreader to prevent separation and settling.

D) Seeding Rates - Rates are specified in the mixture tabulation for the specified mix.

E) Harrowing - The site should be harrowed or raked following seeding.

F) Packing - The site should be packed using a culti-packer or equivalent following harrowing.

G) Mulch - The site should be mulched and disc-anchored following packing using one of the following types of mulch (as per plans or special provisions):

- Mn/DOT Type 3 (MCIA certified weed free mulch) at a rate of 2.0 tons per acre.
- Prairie hay/mulch (Mn/DOT Type 7 or 8) at a rate of 2.0 tons per acre.
- Mn/DOT Hydraulic Soil Stabilizer or Bonded Fiber Matrix on inaccessible sites.

Method 5. Hydroseeding

Hydroseeding is an acceptable method for establishing natives when it is done correctly. However, it is imperative that the site is prepared and finished properly. Mn/DOT generally uses hydroseeding on steep slopes or other areas inaccessible to a seed drill such as wetland edges and ponds. Hydro-seeding native grasses and forbs is not recommended if the extended weather patterns are hot and dry and the soil surface is dry and dusty.

The seed-water mixture should be applied within one hour after the seed is added to the hydro-seeder tank.

A) Site Preparation - The site should be prepared by loosening topsoil to a minimum depth of 3 inches. It is critical that the seedbed be loosened to a point that there are a lot of spaces for seed to filter into cracks etc., otherwise it may end up on the surface and wash away with the first heavy rain.

B) Fertilizer - If used, the fertilizer used should be a commercial grade of slow release complete fertilizer applied at a rate of 300 lbs/acre at the time of preparing the seed bed for seeding. The fertilizer should contain 10-20-20 (NPK) analysis.

C) Seed Installation - Seed should be installed by hydro-seeding it evenly over the entire site. A fan-type nozzle should be used with approximately 500 gallons of water per acre. It is recommended to add approximately 75 pounds of hydromulch per 500 gallons of water for a visual tracer to ensure uniform coverage.

D) Seeding Rates - Rates are specified in the mixture tabulation for the specified mix.

E) Harrowing - The site should be harrowed or raked following seeding.

F) Packing - The site should be packed using a culti-packer or equivalent following harrowing.

G) Mulch - The site should be mulched and disc-anchored following packing using one of the following types of mulch (as per plans or special provisions):

- Mn/DOT Type 3 (MCIA certified weed free mulch) at a rate of 2.0 tons per acre.
- Prairie hay/mulch (Mn/DOT Type 7 or 8) at a rate of 2.0 tons per acre.
- Mn/DOT Hydraulic Soil Stabilizer or Bonded Fiber Matrix on inaccessible sites.

NOTE: When seeding in conjunction with a hydraulic soil stabilizer (bonded fiber matrixes (BFM's), hydro-mulches, etc., it is recommended that a two-step operation be used. Seed should be placed first and the hydraulic soil stabilizer be sprayed on afterwards. This is to ensure that seed comes into direct contact with the soil.

Maintenance Requirements

General Seed Mixtures (25-121, 25-141 and 25-142)
Year 1
Maintenance after Spring or Early Summer Seeding:
1) Mowing during early Fall may be necessary if weed infestation or shading becomes a problem.
2) Weed Control – mowing should help control annual weeds. Spot spray thistles etc.
3) If plants are growing slowly, you can apply fertilizer (20-10-10 analysis) as necessary over the top to improve growth.

Maintenance after Fall or Dormant Seeding:
1) Mowing in May or June may be necessary if weed infestation becomes a problem.
2) Weed Control – mowing should help control annual weeds. Spot spray thistles etc.

Long Term
Maintenance:
1) Can mow 3 times per year as desired.
2) Spot spray weeds as needed.

Turfgrass Mixtures (25-131 and 25-151)
Year 1
1) Provide water if necessary to aid establishment
2) After turf grasses reach a height of 6 inches, initially mow to a height of 2 to 3 inches.

Long Term
1) Fertilize and water as needed.
2) Mow a minimum of once every 2 weeks.

Native Grass and Forb Mixtures (mixtures beginning with the number 3)
Year 1
Establishment (spring seeding):
1) Prepare site - Late April - May.
2) Seed - May 1 – June 1.
Maintenance:
1) Mow (6-8 inches) – every 30 days after planting until September 30.
2) Weed Control - mowing should help control annual weeds. Spot spray thistles etc.

Establishment (fall seeding):
1) Prepare site - Late August - early September.
2) Seed - late September to freeze-up.
Maintenance (following season):
1) Mow (6-8 inches) – once in May, June and July.
2) Weed Control - mowing should keep annual weeds down. Spot spray thistles etc.

Evaluation:
1) Cover crop growing within 2 weeks of planting (except dormant plantings).
2) Seedlings spaced 1-6 inches apart in drill rows.
3) Native grass seedlings may only be 4-6 inches tall.
4) If there is a flush of growth from foxtail etc., mow as necessary.

Year 2
Maintenance:
1) Mow (6-8 inches) one time between June 1 - August 15 before weeds set seed.
2) Weed Control - mowing should keep annual weeds down. Spot spray thistles etc.
3) Some sites may not require much maintenance the second year.
Evaluation:
1) Cover crop will be gone unless winter wheat was used in a fall planting.
2) Grasses forming clumps 1-6 inches apart in drill rows, but still short.
3) Some flowers should be blooming (black-eyed Susans, bergamot etc.).
4) If there is a flush of growth from foxtail etc., mow site.

Year 3
Maintenance:
1) Mow only if necessary.
3) Weed Control - Spot spray thistles, etc.
4) Sites usually do not require much maintenance the third year.
Evaluation:
1) Planting should begin looking like a prairie - tall grasses, flowers etc.

Long-term
Maintenance:
1) Weed Control - Spot spray thistles etc.
2) Burning (3-5 year rotation) alternate spring and fall if possible.
3) Haying (3-5 year rotation) late summer or early fall. Alternate with burning (may substitute for burning).
4) Burning two years in a row will really “clean up” rough-looking sites.