

**Table 1A:**  
**Establishment Recommendations for Seed Production**

*This table lists recommendations for propagating native species for seed production purposes.*

**Seed Weights:** Published seed counts, Prairie Moon Nursery 2007, [www.prairiemoonnursery.com](http://www.prairiemoonnursery.com)

**Establishment methods:** DS = Direct Seed with a native seed drill or plot planter; GH = Greenhouse propagation from seed; DIV = Division of roots or corms for immediate transplanting.

**Seeding times:** Dormant (soil temperature below 32- 38 F°), Fall/Early Spring (soil temperatures 40-50 F°), Late Spring (soil temperatures above 60 F°)

**Transplanting Time:**

*Seedlings* - Spring = when soil warms and frost is not imminent. These species are somewhat cold hardy, but seedlings should be hardened-off for at least one week before transplanting. Late Spring=(soil temperatures above 50 F°) and seedlings have been hardened off. After Last Frost = especially critical for legume species, which are seriously damaged by frost after Spring transplanting. *Division* – Recommendations are for root/corm division and immediate transplanting in the field.

**Seeding Depth:** Most native prairie species should be planted at shallow depths usually ranging from 1/8 to 1/4". Larger seeded species can be planted up to 1/2" in depth. Very tiny seeds should be surface sown, either because they are otherwise planted too deep to emerge, or they require light for germination.

**Direct Seeding Rates:** Rates have been calculated for most species, even if Direct Seeding (DS) is not recommended. These are intended as guidelines, only, if direct seeding is attempted. Thorough weed suppression and control BEFORE direct seeding is always critical to successfully establish a seed production field.

SPECIES		SEED WEIGHTS		Recommended Estbl. Method	SEEDING TIME	TRANSPLANTING TIME		SEEDING DEPTH	DIRECT SEEDING RATES (Calculated @ 40 seeds linear/ft <sup>2</sup> )		
Common Name	Scientific Name	Seeds/Oz	Seeds/lb		DIRECT SEED	SEEDLINGS	DIVISION	DEPTH	36" Rows	24" Rows	12" Rows
<b>WILDFLOWERS</b>											
Canada anemone	<i>Anemone canadensis</i>	8000	128000	DS, GH, DIV	Dormant	Spring	Spring/Fall	1/4"	4.5	6.1	12.1
Thimbleweed	<i>Anemone cylindrica</i>	26000	416000	GH	-	Spring	Spring	1/4"	1.3	1.8	3.7
Prairie sage	<i>Artemisia ludoviciana</i>	250000	4000000	GH, DIV	-	Spring	Spring/Fall	SURFACE	0.1	0.1	0.3
Butterfly milkweed	<i>Asclepias tuberosa</i>	4300	68800	DS, GH	Dormant	Spring	Fall	1/4"	8.4	11.2	22.5
Sky blue aster	<i>Aster azureus</i>	80000	1280000	GH	-	Spring	Spring	1/4"	0.4	0.6	1.2
Smooth blue aster	<i>Aster laevis</i>	55000	880000	GH	-	Spring	Spring	1/4"	0.6	0.8	1.7
New England aster	<i>Aster novae-angliae</i>	66000	1056000	DS	Dormant	Spring	Spring/Fall	1/4"	0.5	0.7	1.4
Prairie coreopsis	<i>Coreopsis palmata</i>	10000	160000	DS	Dormant	Spring	Spring/Fall	1/4"	3.6	4.8	9.6
Pale purple coneflower	<i>Echinacea pallida</i>	5200	83200	DS, GH	Dormant	Spring	Spring	Cover Lightly	6.9	9.3	18.6

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SPECIES	SEED WEIGHTS		Recommended Estbl. Method	SEEDING TIME	TRANSPLANTING TIME		SEEDING DEPTH	DIRECT SEEDING RATES (Calculated @ 40 seeds linear/ft <sup>2</sup> )		
	Seeds/Oz	Seeds/lb			SEEDLINGS	DIVISION		36" Rows	24" Rows	12" Rows
<b>WILDFLOWERS</b>										
Rattlesnake master	7500	120000	DS, GH	Dormant	Spring	Spring	1/4"	4.8	6.4	12.9
Bottle gentian	280000	4480000	GH	-	Spring	Spring	SURFACE	0.1	0.1	0.3
Oxeye false-sunflower	6300	100800	DS	Dormant	Spring	Spring	1/4"	5.7	7.6	15.3
Rough blazing-star	16000	256000	GH, DIV	-	Spring	Spring	1/4"	2.2	3.0	6.1
Blazing-star	11000	176000	GH, DIV	-	Spring	Spring	1/4"	3.3	4.4	8.7
Great blue lobelia	500000	8000000	GH	-	Spring	Spring	SURFACE	0.1	0.1	0.1
Wild bergamot	70000	1120000	DS	Dormant	Spring	Spring	SURFACE	0.5	0.6	1.3
Wild quinine	7000	112000	DS, GH	Dormant	Spring	Spring	1/4"	5.1	6.9	13.8
Hairy Mt. mint	185000	2960000	DS, GH	Dormant	Spring	Spring	SURFACE	0.1	0.2	0.5
Narrowleaved Mt. mint	378000	6048000	GH	-	Spring	Spring	SURFACE	0.1	0.1	0.2
Virginia Mt. mint	220000	3520000	DS, GH	-	Spring	Spring	SURFACE	0.1	0.2	0.4
Greyhead coneflower	30000	480000	DS	Dormant	Spring	Spring	1/4"	1.2	1.6	3.2
Sweet coneflower	43000	688000	DS?, GH	Dormant	Spring	Spring	1/4"	0.8	1.1	2.2
Rosinweed	1200	19200	GH	-	Spring	Spring	1/4-1/2"	-	-	-
Compass plant	660	10560	GH	-	Spring	Spring	1/4-1/2"	-	-	-
Stiff goldenrod	41000	656000	DS	Dormant	Spring	Spring	1/4"	0.8	1.1	2.3
Showy goldenrod	95000	1520000	GH	-	Spring	Spring	1/4"	0.3	0.5	1.0
Prairie spiderwort	10000	160000	GH, DIV	-	Spring	Spring	1/4"	3.6	4.8	9.6

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SPECIES	Common Name	SEED WEIGHTS		Recommended Estbl. Method	SEEDING TIME	TRANSPLANTING TIME		SEEDING	DIRECT SEEDING RATES (Calculated @ 40 seeds linear/ft <sup>2</sup> )			
		Seeds/Oz.	Seeds/lb			SEEDLINGS	DIVISION		DEPTH	36" Rows	24" Rows	12" Rows
<b>WILDFLOWERS</b>												
	<i>Tradescantia ohiensis</i>	8000	128000	GH, DIV	-	Spring	Spring/Fall	1/4"	4.5	6.1	12.1	
	<i>Veronicastrum virginicum</i>	800000	1280000	GH, DIV	-	Spring	Spring/Fall	SURFACE	0.0	0.1	0.1	
	<i>Zizia aurea</i>	11000	176000	DS, GH	Dormant	Spring		1/4"	3.3	4.4	8.7	

SPECIES	Common Name	SEED WEIGHTS		Recommended Estbl. Method	SEEDING TIME	TRANSPLANTING TIME		SEEDING	DIRECT SEEDING RATES (Calculated @ 40 seeds linear/ft <sup>2</sup> )			
		Seeds/Oz.	Seeds/lb			SEEDLINGS	DIVISION		DEPTH	36" Rows	24" Rows	12" Rows
<b>GRASSES-WARM</b>												
	<i>Andropogon gerardii</i>	10000	160000	DS	Late Spring	Late Spring		1/4"-1/2"	3.6	4.8	9.7	
	<i>Bouteloua curtipendula</i>	11900	191000	DS	Late Spring	Late Spring		1/4"-1/2"	3.0	4.0	8.0	
	<i>Panicum virgatum</i>	14000	224000	DS	Dormant	Late Spring		1/4"	2.6	3.5	6.0	
	<i>Schizachyrium scoparium</i>	15000	240000	DS	Late Spring	Late Spring		1/4"	2.4	3.2	6.5	
	<i>Sorghastrum nutans</i>	12000	192000	DS	Late Spring	Late Spring		1/4"	3.3	5.0	10.0	
	<i>Spartina pectinata</i>	6600	105600	GH, DIV	Late Spring	Late Spring	Spring	1/4"	NOT RECOMMENDED			
	<i>Sporobolus asper</i>	30000	480000	DS	Late Spring	Late Spring		1/4"	1.2	1.8	3.6	
	<i>Sporobolus heterolepis</i>	16000	256000	GH, DIV		Late Spring		1/4"	NOT RECOMMENDED			
											4.0	

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SPECIES	SEED WEIGHTS		Recommended Estbl. Method	SEEDING TIME	TRANSPANTING TIME		SEEDING DEPTH	DIRECT SEEDING RATES (Calculated @ 40 seeds linear/ft <sup>2</sup> )		
	Seeds/Oz.	Seeds/lb			SEEDLINGS	DIVISION		36" Rows	24" Rows	12" Rows
<b>GRASSES-COOL</b>										
Bluejoint grass	280000	4480000	GH, DIV	Fall/Early spring	Spring	Spring/Fall	1/4"	NOT RECOMMENDED		
Canada wildrye	5200	83200	DS	Fall	Spring		1/4"	7.0	9.3	18.6
Virginia wildrye	4200	67200	DS	Fall	Spring		1/4"	8.6	11.5	23.1
Junegrass	200000	3200000	GH	-	Spring		Cover Lightly	NOT RECOMMENDED		
<b>LEGUMES</b>										
Canada milkvetch	17000	272000	DS	Dormant	After last frost		1/4"	2.1	2.8	5.7
White wild indigo	1700	27200	GH	Dormant	After last frost		1/4"	-	-	-
Cream Wild Indigo	1400	22400	GH	Dormant	After last frost		1/4"	-	-	-
White prairie clover	19000	304000	DS?, GH	Dormant	After last frost		1/4"	1.9	2.5	5.1
Purple prairie clover	18000	288000	DS	Dormant	After last frost		1/4"	2.0	2.7	5.4
Showy tick-trefoil	5500	88000	DS	Dormant	After last frost		1/4"	6.6	8.8	17.6
Roundhead bush clover	8000	128000	DS	Dormant	After last frost		1/4"	4.5	6.1	12.1



**Table 2A:  
Seed Pre-treatments for Germination**

GREENHOUSE PROPAGATION		PRE-TREATMENT					SOWING			TRANSPLANTING
SPECIES	Scientific Name	SCARIFICATION	Stratification			RHIZOBIUM INOCULUM	LIGHT REQUIRED	PLANTING DEPTH	DATE	
Common Name		Moist	Dry	Warm	Cold	Outdoor	# Weeks			
<b>WILDFLOWERS</b>										
		68-76° F 32-45° F <small>Winter Ambient</small>								
Rough blazing-star	<i>Liatris aspera</i>	X			X		8-12		1/4"	Spring
Blazing-star	<i>Liatris pycnostachya</i>	X			X		8-12		1/4"	Spring
Great blue lobelia	<i>Lobelia siphilitica</i>		X		X		12	X	SURFACE	Spring
Wild bergamot	<i>Monarda fistulosa</i>		X		X		8-12		SURFACE	Spring
Wild quinine	<i>Parthenium integrifolium</i>	X			X		8-12		1/4"	Spring
Hairy Mt. mint	<i>Pycnanthemum pilosum</i>		X		X		12	?	SURFACE	Spring
Narrowleaved Mt. mint	<i>Pycnanthemum tenuifolium</i>		X		X		12	?	SURFACE	Spring
Virginia Mt. mint	<i>Pycnanthemum virginianum</i>		X		X		12	?	SURFACE	Spring
Greyhead coneflower	<i>Ratibida pinnata</i>	X			X		8-12		1/4"	Spring
Sweet coneflower	<i>Rudbeckia subtomentosa</i>	X			X		8-12		1/4"	Spring
Rosinweed	<i>Siphium integrifolium</i>	X			X		8-12		1/4-1/2"	Spring
Compass plant	<i>Siphium laciniatum</i>	X			X		8-12		1/4-1/2"	Spring
Stiff goldenrod	<i>Solidago rigida</i>	X			X		8-12		1/4"	Spring
Showy goldenrod	<i>Solidago speciosa</i>	X			X		8-12		1/4"	Spring
Prairie spiderwort	<i>Tradescantia bracteata</i>	X			X		12		1/4"	Spring
Ohio spiderwort	<i>Tradescantia ohioensis</i>	X			X		12		1/4"	Spring
Culver's root	<i>Veronicastrum virginicum</i>		X		X		12	X	SURFACE	Spring
Golden Alexander	<i>Zizia aurea</i>	X		?	X	or X	12		1/4"	Spring

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GREENHOUSE PROPAGATION		PRE-TREATMENT					SOWING			TRANSPLANTING
SPECIES		SCARIFICATION	Stratification			# Weeks	RHIZOBIUM INOCULUM	LIGHT REQUIRED	PLANTING DEPTH	DATE
Common Name	Scientific Name		Moist	Dry	Warm					
GRASSES-WARM										
Big bluestem	<i>Andropogon gerardii</i>		X		X	-			1/4"-1/2"	Late Spring
Side-oats grama	<i>Bouteloua curtipendula</i>		X		X	-			1/4"-1/2"	Late Spring
Switchgrass	<i>Panicum virgatum</i>	X			X	4			1/4"	Late Spring
Little bluestem	<i>Schizachyrium scoparium</i>		X		X	-			1/4"	Late Spring
Indian grass	<i>Sorghastrum nutans</i>		X		X	-			1/4"	Late Spring
Prairie cordgrass	<i>Spartina pectinata</i>	X			X	4			1/4"	Late Spring
Tall dropseed	<i>Sporobolus asper</i>		X		X	-			1/4"	Late Spring
Prairie dropseed	<i>Sporobolus heterolepis</i>	X			X	4			1/4"	Late Spring
GRASSES-COOL										
Bluejoint grass	<i>Calamagrostis canadensis</i>		X		X	-			1/4"	Spring
Woodland reedgrass	<i>Cinna arundinacea</i>		X		X	-			CoverLightly	Spring
Canada wildrye	<i>Elymus canadensis</i>		X		X	-			1/4"	Spring
Virginia wildrye	<i>Elymus virginicus</i>		X			-			1/4"	Spring
Junegrass	<i>Koeleria macanthera</i>		X		X	-			CoverLightly	Spring
Upland wild timothy	<i>Muhlenbergia racemosa</i>		X		X	-			CoverLightly	Spring
Porcupine grass	<i>Stipa spartea</i>	X			X	12	or X		1/4"	Spring

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GREENHOUSE PROPAGATION		PRE-TREATMENT						SOWING			TRANSPLANTING
SPECIES		SCARIFICATION	Stratification			# Weeks	RHIZOBIUM INOCULUM	LIGHT REQUIRED	PLANTING DEPTH	DATE	
Common Name	Scientific Name		Moist	Dry	Warm						Cold
<b>LEGUMES</b>											
				68-76° F 32-45° F							
				Winter Ambient							
Cream Wild Indigo	<i>Baptisia bracteata</i>	X	X		X		2	X	1/4"	After last frost	
White prairie clover	<i>Dalea candida</i>	X	X		X		12	X	1/4"	After last frost	
Purple prairie clover	<i>Dalea purpurea</i>	X	X		X		12	X	1/4"	After last frost	
Showy tick-trefoil	<i>Desmodium canadense</i>	X or Not	X		X		12	X	1/4"	After last frost	
Roundhead bush clover	<i>Lespedeza capitata</i>	X			X		2	X	1/4"	After last frost	
Canada milkvetch	<i>Astragalus canadensis</i>	X	X		X		2	X	1/4"	After last frost	
White wild indigo	<i>Baptisia alba</i>	X	X		X		2	X	1/4"	After last frost	
<b>SEDGES</b>											
Prairie sedge	<i>Carex bicknellii</i>		X		X		8		SURFACE	Spring/Fall	
Plains Oval Sedge	<i>Carex brevior</i>		X <sup>1</sup>		X		8		SURFACE	Spring/Fall	
Heavy sedge	<i>Carex gravida</i>		X		X		8		SURFACE	Spring/Fall	
<b>SHRUBS</b>											
Leadplant	<i>Amorpha canescens</i>	X	X		X		2	X	1/4"	After last frost	
New Jersey tea	<i>Ceanothus americana</i>	X <sup>2</sup>	X		X		12		1/4"	After last frost	

- This species will germinate from fresh seed
- Cover fresh seed with boiling hot water for a few moments, drain.



## Table 1B:

## Seed Production – Harvesting

'Seed Maturity' and 'Harvest Date Range' are based on data from the Tallgrass Prairie Center in Cedar Falls, IA, (Approximately 42° 33' N, 92° 24' W) between 2001-2006. 'Yield Range/Acre' is extrapolated from small seed increase plots. Wildflower and legume (forb) plots are on the order of 1000-2500 sq ft, mostly at 34" row spacing, either in weed barrier or bare soil with cultivation between rows. Grass increase fields are mostly direct-seeded solid stands on the order of 0.1 to 0.5 acres, except for those recommending greenhouse propagation. 'Productive Stand Life' is an estimate based on data at the Tallgrass Prairie Center and/or published NRCS data.

COMMON NAME	SCIENTIFIC NAME	Harvest Method	Seed Maturity	Harvest Date Range <sup>1</sup>	Shatter Potential	Yield Range	Productive Stand Life
<b>GRASSES-WARM</b>							
Big bluestem	<i>Andropogon gerardii</i>	Combine	Oct.	10/5 - 10/15	Moderate	80-150	10-15
Side-oats grama	<i>Bouteloua curtipendula</i>	Combine	Sept.-Oct.	9/22 - 10/7	Low	100-200	10-15
Switchgrass	<i>Panicum virgatum</i>	Combine	Sept.-Oct.	9/24 - 10/8	Moderate	100-250	10-15
Tall dropseed	<i>Sporobolus compositus</i>	Combine	Oct.	10/8 - 10/25	High	150-250	10-15
Prairie cordgrass	<i>Spartina pectinata</i>	Combine	Sept.-Oct.	10/7 - 10/29	Moderate	15-30	3-5?
Prairie dropseed	<i>Sporobolus heterolepis</i>	Combine	Oct.	10/7 - 10/17	High	100-250	10-15
Little bluestem	<i>Schizachyrium scoparium</i>	Combine	Oct.	10/10 - 10/29	Moderate	50-120	10-15
Indian grass	<i>Sorghastrum nutans</i>	Combine	Sept.-Oct.	10/1 - 10/9	High	50-130	10-15
<b>GRASSES-COOL</b>							
Bluejoint grass	<i>Calamagrostis canadensis</i>	Hand-pick	Early July	6/29 - 7/7	High	5-10	?
Canada wildrye	<i>Elymus canadensis</i>	Combine	Sept.	9/15 - 10/11	Moderate	100-250	3-6
Virginia wildrye	<i>Elymus virginicus</i>	Combine	Aug.-Sept.	8/29-9/12	Moderate	600-?	3-6?
Junegrass	<i>Koeleria macanthra</i>	Combine?	Early July	7/1 - 7/8	Low	50-200	1-3
Porcupine grass	<i>Stipa spartea</i>	Hand-pick	Late June	~End of June	Very High	?	?

<sup>1</sup>Harvest Dates are at the Tallgrass Prairie Center, Cedar Falls, IA.

**Table 1B:  
Seed Production – Harvesting**

COMMON NAME	SCIENTIFIC NAME	Harvest Method	Seed Maturity	Harvest Date Range <sup>1</sup>	Shatter Potential	Yield Range	Productive Stand Life
<b>LEGUMES</b>							
Leadplant	<i>Amorpha canescens</i>	Hand-pick	Oct.	10/12 - 10/14	Low	10-50	10-15?
Canada milkvetch	<i>Astragalus canadensis</i>	Hand-pick	Aug.-Sept.	8/11 - 9/2	Moderate	100-200	2-3?
Cream Indigo	<i>Baptisia lactea</i>	Hand-pick	Aug.-Sept.	9/13 - 10/8	Low	50-150	5-10
White wild indigo	<i>Baptisia leucantha</i>	Hand-pick	Sept.-Oct.	9/16 - 10/21	Low	50-150	5-10
White prairie clover	<i>Dalea candida</i>	Combine	Sept.-Oct.	11/1 - 11/6	Low	?	5-10
Purple prairie clover	<i>Dalea purpurea</i>	Combine	Sept.-Oct.	9/20 - 11/05	Low	50-200	5-10
Showy tick-trefoil	<i>Desmodium canadense</i>	Combine	Sept.-Oct.	9/18 - 10/10	Low	50-150	5-10
Roundhead bush clover	<i>Lespedeza capitata</i>	Combine	Oct.	10/16 - 10/23	Low	50-?	5-10
<b>WILDFLOWERS</b>							
Canada anemone	<i>Anemone canadensis</i>	Combine	July	7/17 - 7-26	High	50-180	5-10
Thimbleweed	<i>Anemone cylindrica</i>	Hand-pick	July	7/28-7/29	Moderate	?	2-3
Prairie sage	<i>Artemisia ludoviciana</i>	Combine	October	10/16 - 10/24	Moderate	5-15	2-3
Butterfly milkweed	<i>Asclepias tuberosa</i>	Hand-pick	Aug.-Oct.	9/2 - 10/17	High	10-80	3-5
Smooth blue aster	<i>Aster laevis</i>	Combine	Oct.	10/20 - 10/31	High	40-90	3-5
New England aster	<i>Aster novae-angliae</i>	Combine	Sept.-Oct.	10/7 - 10/25	High	20-40	3-5
Stiff coreopsis	<i>Coreopsis palmata</i>	Combine	Oct.	10/9 - 10/20	Low	40-140	3-5
Pale purple coneflower	<i>Echinacea pallida</i>	Combine	Sept.	9/1 - 9/23	Low	50-250	3-5
Rattlesnake master	<i>Eryngium yuccifolium</i>	Combine	Oct.	10/8 - 10/25	Moderate	200-800	3-5
Bottle gentian	<i>Gentiana andrewsii</i>	Hand-pick	Sept.-Oct.	9/22 - 10/14	High	40-90	3-5

<sup>1</sup>Harvest Dates are at the Tallgrass Prairie Center, Cedar Falls, IA.

**Table 1B:  
Seed Production – Harvesting**

COMMON NAME	SCIENTIFIC NAME	Harvest Method	Seed Maturity	Harvest Date Range <sup>1</sup>	Shatter Potential	Yield Range	Productive Stand Life
<b>WILDFLOWERS</b>							
Oxeye false-sunflower	<i>Helopsis helianthoides</i>	Combine	Sept.-Oct.	9/22 - 10/10	High	50-150	5-7
Rough blazing-star	<i>Liatris aspera</i>	Combine?	Sept.-Oct.	10/1 - 10/13	High	50-150	3-5
Blazing-star	<i>Liatris pycnostachya</i>	Combine?	Sept.-Oct.	9/12 - 10/9	High	150-450	3-5
Great blue lobelia	<i>Lobelia siphilitica</i>	Hand-pick	Sept.	9/27 - 10/9	High	50-280	1-3
Wild bergamot (Horsemint)	<i>Monarda fistulosa</i>	Combine	Sept.-Oct.	9/30 - 10/1	Moderate	30-90	3-5
Wild quinine	<i>Parthenium integrifolium</i>	Combine	Oct.	10/23 - 11/3	Moderate	150-250	5-10
Mountain mint	<i>Pycnanthemum virginianum</i>	Combine	Sept.-Oct.	10/6 - 10/20	Moderate	25-70	3-5
Hairy mountain mint	<i>Pycnanthemum pilosum</i>	Combine	Sept.-Oct.	10/8 - 10/21	Moderate	20-90	3-5
Slender mountain mint	<i>Pycnanthemum tenuifolium</i>	Combine	Sept.-Oct.	10/16 - 10/18	Moderate	10-80	3-5
Greyhead coneflower	<i>Ratibida pinnata</i>	Combine	Sept.	9/20 - 10/12	Low	100-250	3-5
Sweet coneflower	<i>Rhudbeckia subtomentosa</i>	Combine	Oct.	10/18 - 11/3	Moderate	80-170	3-5
Rosinweed	<i>Silphium integrifolium</i>	Combine	Sept.-Oct.	9/24 - 10/10	High	100-370	3-5
Compass plant	<i>Silphium laciniatum</i>	Combine	Aug.-Sept.	8/30 - 9/27	High	40-130	5-7
Stiff goldenrod	<i>Solidago rigida</i>	Combine	Oct.	10/9 - 10/25	High	100-250	3-7
Showy goldenrod	<i>Solidago spectosa</i>	Combine	Oct.-Nov.	10/12 - 11/3	High	30-130	2-3
Ohio spiderwort	<i>Tradescantia ohioensis</i>	Hand-pick	July	7/6 - 7/23	Very High	40-100	3-5
Culver's root	<i>Veronicastrum virginicum</i>	Combine	Sept.-Oct.	9/25 - 10/8	High	80-150	2-4
Golden Alexander	<i>Zizia aurea</i>	Combine	Aug.-Sept.	8/31 - 9/8	High	100-270	3-5

<sup>1</sup>Harvest Dates are at the Tallgrass Prairie Center, Cedar Falls, IA.

**Table 2B:****Massey-Ferguson Plot Combine Settings Model Breeders Special 8**

## Combine Settings

These combine settings are for selected species based on harvesting experience at USDA-NRCS Elsberry Plant Materials Center, Elsberry, MO.

Common Name	Scientific Name	Concave Settings	Amount of Air	Sieve Opening	Where Bagged
Big Bluestem	<i>Andropogon gerardi</i>	9	1	1/4	Rear
New England Aster	<i>Aster novae-angliae</i>	6	No Air	1/4	Rear
Sideoats Gramma	<i>Bouteloua curtipendula</i>	6	No Air	1/8	Rear
Prairie Coreopsis	<i>Coreopsis palmata</i>	6	No Air	Closed	Rear
Purple Prairie Clover	<i>Dalea purpurea</i>	6	1	1/8	Rear
Tick Trefoil (Sticktites)	<i>Desmodium canadense</i>	6	1	1/4	Rear
Pale Purple Coneflower	<i>Echinacea pallida</i>	6	1	1/4	Rear
Canada Wild Rye	<i>Elymus canadense</i>	9	1	1/2	Hopper
Virginia Wild Rye	<i>Elymus virginicus</i>	8	1	1/4	Hopper
Rattlesnake Master	<i>Eryngium yuccifolium</i>	6	No Air	1/4	Rear
Oxeye False Sunflower	<i>Heliopsis helianthoides</i>	6	1	Closed	Rear
Roundhead Bushclover	<i>Lespedeza capitata</i>	6	1	1/8	Rear
Rough Blazing Star	<i>Liatris aspera</i>	6	No Air	1/4	Rear
Prairie Blazing Star	<i>Liatris pycnostachya</i>	6	No Air	1/8-1/4	Rear
Great Blue Lobelia	<i>Lobelia siphilitica</i>		Hand Harvested		
Horsemint	<i>Monarda fistulosa</i>	6	No Air	Closed	Rear
Foxglove Beardtongue	<i>Penstemon digitalis</i>		Hand Harvested		
Grayhead Coneflower	<i>Ratibida pinnata</i>	6	No Air	1/8	Rear
Little Bluestem	<i>Schizachrium scoparium</i>	6	No Air	1/4	Rear
Stiff Goldenrod	<i>Solidago rigida</i>	6	No Air	Closed	Rear
Indiangrass	<i>Sorghastrum nutans</i>	6	1	1/4	Rear
Tall Dropseed	<i>Sporobolus asper</i>	6	No Air	Closed	Rear

- When amount of air is (NO AIR), belt running fan is disconnected.
- Sieve opening is an estimation, trial and error may be needed.

Table 1C:

**SCREEN SIZES, WESTRUP LABORATORY AIR SCREEN CLEANER**

Westrup Laboratory Air Screen Cleaner Settings

The Westrup Laboratory Air Screen Cleaner has three screens and an aspiration chamber for blowing off light seed and chaff. Screen and valve settings are beginning points only and will need to be adjusted for annual variations in seed size, seed quality, and contaminating weed species. Valve settings are unique to the Westrup air screen cleaner, but screen sizes can be converted to numerical sieve sizes or inches using Screen Conversion chart in this appendix.

SPECIES	Harvest Method	Treatment before A/S Cleaning	Westrup A/S CLEANER			Air-flow Valves			General Notes
			Screens (mm)		SIFTING Bottom	Cyclone #1	Damper #2	Final #3	
			SCALPING Top	Middle					
<b>GRASSES</b>									
Big bluestem (ANGE)	Combined	Debeard	4.00	1.6 slot	0.80	1.00	1.75	1.75	Indent to remove foxtail
Side-oats grama (BOCU)	Combined		5.50	5.00	3.00	6.00	2.50	1.00	
Bluejoint grass (CACA)	Clipped	Brush	1.00	0.80	0.50	9.50	0.50	0.50	
Canada wildrye (ELCA)	Combined	Debeard	4.40	3.60	1.20	4.00	2.00	2.50	Indent to remove foxtail
Junegrass (KOMA)	Combined	Brush	1.6 slot	.8 slot	0.50	1.50	0.50	.5-1.5	
Switchgrass (PAVI)	Combined		3.00	2.00	0.90	6.00	1.00	2.00	
Little bluestem (SCSC)	Combined	Debeard	4.00	1.6 slot	0.70	2.00	1.00	2.50	Indent to remove foxtail
Indian grass (SONU)	Combined	Debeard	4.00	3.40	0.80	1.00	0.75	1.75-2.25	Indent to remove foxtail
Prairie cordgrass (SPPE)	Combined		7.00	1.8 slot	2.00	3.00	1.50	1.5-2.0	
Tall dropseed (SPAS)	Combined	1/4" mesh*	3.00	1.40	0.70	6.50	4.00	2.00	
Prairie dropseed (SPHE)	Combined	1/4" mesh	4.00	3.20	1.50	2.00	2.50	2.50	
<b>LEGUMES</b>									
Leadplant (AMCA)	Combined	Brush	3.40	3.20	1.00	6.00	6.00	2.00	
Canada milkvetch (ASCA)	Combined		2.80	1.80	1.00	6.00	2.00	3.25-4.00	
Cream Indigo (BALA)	Combined		5.00	6.00	3.50				
White wild indigo (BALE)	Combined		4.80	4.40	2.40	5.00	6.00	4-4.5	
White prairie clover (DACA)	Combined	Brush	6.00	2.00	1.75	6.00	2.00	1.75	
Purple prairie clover (DAPU)	Combined	Brush	3.00	1.70	0.90	6.00	2.00	2-3	
Showy tick-trefoil (DECA)	Combined	Brush	3.00	2.80	1.20	6.00	2.00	3.5-4.0	
Roundhead bush clover (LECA)	Combined	Brush	4.00	2.00	1.20	6.50	4.00	2.50	
<b>WILDFLOWERS</b>									
Canada anemone (ANCA)	Combined	1/2" mesh	5.50	5.00	3.00	3.00	2.00	2.25	
Thimbleweed (ANCY)	Combined	Brush	5.00	2.80	1.00	5.00	2.25	1.25	
Prairie sage (ARLU)	Combined	Brush	0.90	0.80	0.50	6.00	1.50	1.00	

\* Combined material is rough-screened through indicated mesh size (hardware cloth) to remove large stems to make material more flowable for airscreening

Table 1C:

**SCREEN SIZES, WESTRUP LABORATORY AIR SCREEN CLEANER**

SPECIES	Harvest Method	Treatment before A/S Cleaning	Westrup A/S CLEANER			Air-flow Valves			General Notes
			Screens (mm)			Cyclone	Damper	Final	
			SCALPING Top	Middle	SIFTING Bottom				
<b>WILDFLOWERS</b>									
New England aster (ASNO)	Combined	Brush	1.6 slot	.8 slot	0.60	4.00	1.00	1.0-2.0	Airscreen 2x
Smooth blue aster (ASLA)	Combined	Brush	1.6 slot	.8 slot	0.70	6.00	1.00	1.00	
Butterfly milkweed (ASTU)	Hand pick	Hammermill/Debearder?	6.00	5.50	3.00	6.00	3.00	.75-1.5	Airscreen 2x
Stiff coreopsis (COPA)	Combined	1/4" mesh	3.40	3/1.6 slot	.6 slot	3.00	1.00	2-2.5	Airscreen repeatedly
Pale purple coneflower (ECPA)	Combined	1/4" mesh	4/3.8	3.60	1.7/2	4.00	2.00	1.75-2	Airscreen 2x
Rattlesnake master (ERYU)	Combined	1/4" mesh	5.00	3.60	1.20	3.00	4.00	1.25-2	Airscreen 2x
Bottle gentian (GEAN)	Hand pick	1/8" mesh	1.40	.6 slot	.7 md	0.00	0.00	0.75	Static buildup, remove shaker balls!
Oxeye false-sunflower (HEHE)	Combined	1/4" mesh	4.00	2.70	1.4-1.7	5.00	2.50	2.50	
Rough blazing-star (LIAS)	Hand pick	1/2" mesh /brush	3.00	2.40	1.20	2.75	2.00	1.5-2.25	Airscreen 2x
Prairie blazing-star (LIPY)	Hand pick	1/2" mesh /brush	3.00	2.40	1.20	2.75	2.00	1.5-1.75	Airscreen 2x
Great blue lobelia (LOSI)	Hand pick	1/8" mesh	1.60	0.70	0.50	6.00	0.25	0.25	Airscreen 2x
Wild bergamot (MOFI)	Combined	1/4" mesh	1.50	1.20	0.70	3.00	2.00	1.50	Airscreen 2x
Wild quinine (PAIN)	Combined	1/2" mesh /brush	3.40	2.80	1.30	4.00	2.00	1-1.25	Airscreen 2x
VA Mountain mint (PYYV)	Combined	1/4" mesh	1.20	1.10	0.50	6.00	2.00	1.00	Airscreen 2x
Hairy mountain mint	Combined	1/4" mesh	1.10	0.70	0.50	6.00	2.00	1.00	Airscreen 2x
Slender mountain mint	Combined	1/4" mesh	1.10	1.00	0.50	3.00	1.00	0.50	Airscreen 2x
Greyhead coneflower (RAPI)	Combined	1/4" mesh	3.00	2.00	1.20	4.50	1.50	1.75	Airscreen 2x
Sweet coneflower (RUSU)	Combined	1/4" mesh	2.00	1.50	0.70	4.50	1.50	1.75-1.9	Airscreen 2x
Rosinweed (SIIN)	Combined	1/2" mesh	4.0 slot	8.00	4.00	2.00	2.00	2.00	Airscreen repeatedly
Compass plant (SILA)	Combined	1/2" mesh	4.0 slot	10.00	6.00	2.00	2.00	2.50	Airscreen repeatedly
Stiff goldenrod (SORI)	Combined	1/2" mesh /brush	3.00	1.80	0.60	2.50	1.00	2.25	Airscreen 2x
Showy goldenrod (SOSP)	Combined	1/4" mesh /brush	1.00	.6 slot	0.50	7.50	1.00	1-1.5	Airscreen 2x
Bracted spiderwort (TRBR)	Combined	1/4" mesh	3.40	2.80	1.30	6.00	2.00	2.50	
Ohio spiderwort (TROH)	Combined	1/4" mesh	3.40	2.80	1.30	6.00	2.00	3.00	
Culver's root (VEVI)	Combined	1/4" mesh	0.90	0.70	0.50	2.00	0.50	0.50	Airscreen 2x
Golden Alexander (ZIAU)	Combined	1/4" mesh	4.00	3.00	1.20	6.50	2.50	1.5-2	

• Combined material is rough-screened through indicated mesh size (hardware cloth) to remove large stems to make material more flowable for airscreening

**Table 2C:****SEED PROCESSING - WESTRUP BRUSH MACHINE SETTINGS**

The brush machine is versatile and can be used to de-awn grasses, de-hull legumes, remove the pappus or other appendages, and break up seed heads of hand-collected materials. The machine rotates two brushes against a drum screen, thus rubbing the material between the brushes and the drum screen (see text in introductory chapters). The brush machine is more aggressive than a debearder, which rubs seed against itself as the chamber becomes filled with seed, so greater care is needed to avoid damaging the seed. These settings have been used effectively at the Tallgrass Prairie Center for brushing the species listed.

SPECIES	BRUSH MACHINE						GENERAL NOTES:
	Drum Screen	Brush Type	End Gate	No. Times	RPM	Seed Comes Thru:	
<b>GRASSES</b>							
Big bluestem (ANGE)	7	medium	closed	1	7	screen	
Side-oats grama (BOCU)	10	medium	1/8"	1	7	screen	
Bluejoint grass (CACA)	*14	medium	closed	2-3X	8	screen	*(wrap paper around front half of drum screen)
Canada wildrye (ELCA)	14	stiff	1-1.5"	1	1.5	gate	
Junegrass (KOMA)						screen	
Switchgrass (PAVI)	10	medium	closed	1	7	screen	
Little bluestem (SCSC)	12	medium	1/8-1/4"	1	7	gate	
Indian grass (SONU)	14	soft	1/4-1/2"	1	7	gate	
Prairie cordgrass (SPPE)	5	medium	wide open	1	3	screen	not recommended, may damage seed
Tall dropseed (SPAS)	12	medium	close	1	7	screen	to remove palea/lemma
Prairie dropseed (SPAS)							not recommended
<b>LEGUMES</b>							
Leadplant (AMCA)	14	stiff	1/2 "		7	gate	Difficult to de-hull
Canada milkvetch (ASCA)	7	medium	closed		7	screen	
Cream Indigo (BABR)							
White wild indigo (BAAL)							
White prairie clover (DACA)						screen	
Purple prairie clover (DAPU)	12	stiff	open	2-3X	7	screen	Re-run un-hulled material
Showy tick-trefoil (DECA)	7	medium	closed	1	7	gate	(some seed thru screen)
Roundhead bush clover (LECA)	10	stiff	closed	1	7	screen	
<b>WILDFLOWERS</b>							
Thimbleweed (ANCY)	14	stiff	1/4 "		8.5	screen	
Prairie sage (ARLU)	14	stiff	closed	1	5	screen	Caution! Minimum vacuum!
New England aster (ASNO)	12	soft	closed	1	6	screen	Caution! Minimum vacuum!
Smooth blue aster (ASLA)	12	soft	closed	1	6	screen	Caution! Minimum vacuum!
Butterfly milkweed (ASTU)	14	medium	1"	1		gate	
Prairie coreopsis (COPA)	5	beaters	closed	1	6.5	screen	
Pale purple coneflower (ECPA)	5	*beaters	1/2"	1	7	screen	*all the way in
Rattlesnake master (ERYU)	7	stiff		1	7	gate	
Oxeye false-sunflower (HEHE)	7	medium		1	7	screen	
Rough blazing-star (LIAS)	7	soft	open 1/2"	1	7	screen	
Prairie blazing-star (LIPY)	7	soft	open 1/2"	1	7	screen	
Great blue lobelia (LOSI)	14	medium	1/8"	1	5	screen	Caution! Minimum vacuum!
Wild bergamot (MOFI)	7	medium	1/8-1/4"	1	5	screen	Caution! Minimum vacuum!
Wild quinine (PAIN)	7	medium	open 1/2"	1	7	gate	
VA Mountain mint (PYVI)	10	stiff	1/8-1/4"	1	5	screen	Caution! Minimum vacuum!

**Table 2C:**  
**SEED PROCESSING - WESTRUP BRUSH MACHINE SETTINGS**

SPECIES	BRUSH MACHINE						GENERAL NOTES:
	Drum Screen	Brush Type	End Gate	No. Times	RPM	Seed Comes Thru:	
<b>WILDFLOWERS</b>							
Hairy mountain mint	10	stiff	1/8-1/4"	1	5	screen	
Slender mountain mint	10	stiff	1/8"	1	5	screen	
Stiff goldenrod (SORI)	12	medium	closed	1	7	screen	Caution! Reduce Vacuum!
Showy goldenrod (SOSP)	12	medium	closed	1	7	screen	Caution! Reduce Vacuum!
Culver's root (VEVI)	14	stiff	closed	1	7	screen	Caution! Minimum vacuum!

**Table 3C:**  
**Westrup Settings as used by USDA-NRCS Elsberry Plant Materials Center**

This table includes settings used as a reference point by Elsberry Plant Materials Center, Elsberry, MO. Some of the variation in screen sizes and valve settings as compared to setting used at the Tallgrass Prairie Center may reflect regional differences in seed size, seed quality, and contaminating weed species.

Common Name	Scientific Name	Westrup Brush Machine			Westrup Air and Screen Cleaner					
		Screen Size	RPM Speed	# of Times	#1 Valve	#2 Valve	#3 Valve	Top Screen	Middle Screen	Bottom Screen
Big Bluestem	<i>Andropogon gerardi</i>	10	7	1	6.5	1	2	400	330	90
New England Aster	<i>Aster novae-angliae</i>	12	7	2	5	0.25	1.75	300	170	90
Sideoats Gramma	<i>Bouteloua curtipendula</i>	10	7	1	6.5	2.5	1.5	300	240	90
Prairie Coreopsis	<i>Coreopsis palmata</i>		N/A		5.25	0.5	1	400	300	200
Purple Prairie Clover	<i>Dalea purpurea</i>	12	7	1	6	2	2	300	170	110
Tick Trefoil (Sticktites)	<i>Desmodium canadense</i>	7	7	1	6.5	4	2	400	270	140
Pale Purple Coneflower	<i>Echinacea pallida</i>	5	7	1	4.5	0.75	1.5	400	360	240
Canada Wild Rye	<i>Elymus canadense</i>	7	2	1	4	1	1.75	500	360	200
Virginia Wild Rye	<i>Elymus virginicus</i>		N/A							
Rattlesnake Master	<i>Eryngium yuccifolium</i>	7	7	1	3	2	1.5	500	270	120
Oxeye False Sunflower	<i>Heliopsis helianthoides</i>	7	7	1	5	2.5	2.5	400	270	170
Roundhead Bushclover	<i>Lespedeza capitata</i>	10	7	1	6.5	3.5	2.5	400	200	120
Rough Blazing Star	<i>Liatris aspera</i>	7	7	1	6.5	2.75	1.75	400	270	120
Prairie Blazing Star	<i>Liatris pycnostachya</i>	7	7	2	6.5	3	2	300	240	120
Great Blue Lobelia	<i>Lobelia siphilitica</i>	12	1	1	0	0.5	0.5	300	60	Solid Screen
Horsemint	<i>Monarda fistulosa</i>	7	7	1	5	1	1	300	120	90
Foxglove Beardtongue	<i>Penstemon digitalis</i>	5	7	2	5	0.75	1.75	300	120	60
Grayhead Coneflower	<i>Ratibida pinnata</i>	12	6	1	4.5	0.75	1.5	300	200	120
Little Bluestem	<i>Schizachrium scoparium</i>	12	7	2	6.5	1	1.75	300	270	90
Stiff Goldenrod	<i>Solidago rigida</i>	12	7	1	6.5	1	2	300	140	90
Indiangrass	<i>Sorghastrum nutans</i>	10	7	2	6.5	0.75	1.75	400	300	170
Tall Dropseed	<i>Sporobolus asper</i>	12	7	3	6.5	4	2	300	140	90

- Westrup Brush Machine: Barrel screen sizes are numerical, larger number indicates smaller mesh size.
- Westrup Air/Screen Cleaner: Screen sizes are in millimeters (example: 500 is 5.00 mm or 90 is 0.90 mm)



**Table 4C:**  
**SCREEN SIZES AND CONVERSIONS**

<b>WESTRUP SCREEN SIZES used by the TPC</b>		
Slotted Hole	Round Hole	
Metric (mm)	Metric (mm)	Inches
-	0.50	0.02
0.60	0.60	0.02
0.70	0.70	0.03
0.80	0.80	0.03
0.90	0.90	0.04
1.00	1.00	0.04
-	1.10	0.04
1.20	1.20	0.05
-	1.30	0.05
1.40	1.40	0.06
-	1.50	0.06
1.60	1.60	0.06
-	1.70	0.07
1.80	1.80	0.07
-	1.90	0.07
2.00	2.00	0.08
-	2.20	0.09
2.40	2.40	0.09
-	2.60	0.10
2.80	2.80	0.11
-	3.00	0.12
-	3.20	0.13
-	3.40	0.13
-	3.60	0.14
-	3.80	0.15
4.00	4.00	0.16
-	4.40	0.17
-	4.80	0.19
-	5.00	0.20
-	5.50	0.22
-	6.00	0.24
-	6.50	0.26
-	7.00	0.28
-	7.50	0.30
-	8.00	0.31
-	10.00	0.39

<b>U.S.A STANDARD TESTING SIEVE SIZES</b>		
Sieve Size	Metric (mm)	Inches
#10	2.00	0.079
#14	1.40	0.056
#16	1.18	0.047
#18	1.00	0.039
#20	0.850	0.033
#25	0.710	0.028
#30	0.600	0.023
#35	0.500	0.020
#40	0.425	0.017
#45	0.355	0.014
#50	0.300	0.012
#60	0.250	0.010
#70	0.212	0.008

  

<b>HARDWARE CLOTH (for rough screening)</b>	
Inches	Metric (mm)
1/2" mesh	12.7
1/4" mesh	6.4
1/8" mesh	3.2

These tables list screen sizes(metric and English equivalents) in use by the Tallgrass Prairie Center.

Included are screens used in Westrup Air Screen Cleaner, U.S.A Standard sieve sizes (soil sieves), and hardware cloth mesh used for rough screening combine run material.

**Table 1D:**  
**SAMPLE SEED TEST**

This table presents purity, germination, and dormancy from actual seed test for the species listed. Higher quality lots were intentionally chosen to illustrate the quality of seed that can be produced and cleaned for native species. Note the high percentage of dormancy that can be expected in most legumes, many wildflowers, and even in some species of grasses. This is why proper pre-treatment of seed is so important for germination in greenhouse production. This high percentage of dormant seed is also why fall, dormant, or early spring seeding (which allows for natural cold stratification) is beneficial for many species. Much of the dormancy in grasses is removed during storage (up to a year) and warm-season grasses, particularly, benefit from being seeded into warm soils in late spring (above 60 F).

<b>SAMPLE SEED TEST, FRESH SEED</b>				
<b>SPECIES</b>				
<b>GRASSES-WARM</b>	<b>PURITY</b>	<b>GERM</b>	<b>DORMANT</b>	<b>PLS</b>
Big bluestem (ANGE)	90.19	50.0	44.0	84.8
Side-oats grama (BOCU)	89.95	90.0	0.0	81.0
Bluejoint grass (CACA)	98.37	80.0	5.0	83.6
Canada wildrye (ELCA)	98.31	73.0	20.0	91.4
Junegrass (KOMA)	95.39	74.0	5.0	75.4
Switchgrass (PAVI)	99.94	40.0	55.0	94.9
Little bluestem (SCSC)	82.53	54.0	33.0	71.8
Indian grass (SONU)	94.75	28.0	59.0	82.4
Prairie cordgrass (SPPE)	85.83	91(TZ)	-	-
Tall dropseed (SPAS)	99.91	90.5	0.0	90.4
Prairie dropseed (SPHE)	99.22	43.0	6.0	48.6
Porcupine grass (STSP)	62.89	22.0	57.0	49.7
<b>LEGUMES</b>	<b>PURITY</b>	<b>GERM</b>	<b>HARD</b>	<b>PLS</b>
Leadplant (AMCA)	96.35	7.5	84.0	88.2
Canada milkvetch (ASCA)	95.77	6.0	86.5	88.6
Cream Indigo (BABR)				0.0
White wild indigo (BAAL)	99.98	3.5	95.0	98.5
New Jersey Tea (CEAM)	92.06	12.0	68.0	73.6
White prairie clover (DACA)	99.87	77.0	5.0	81.9
Purple prairie clover (DAPU)	99.69	21.0	74.0	94.7
Showy tick-trefoil (DECA)	99.48	26.5	65.5	91.5
Roundhead bush clover (LECA)	99.74	62.0	34.0	95.8
<b>WILDFLOWERS</b>	<b>PURITY</b>	<b>GERM</b>	<b>DORMANT</b>	<b>PLS</b>
Canada anemone (ANCA)	99.05	21.5	70.5	91.1
Thimbleweed (ANCY)	98.41	91(TZ)	-	-
Prairie sage (ARLU)	98.95	70.0	13.0	82.1
New England aster (ASNO)	91.75	49.0	24.5	67.4
Smooth blue aster (ASLA)	99.24	71.0	19.0	89.3
Skyblue aster (ASAZ)	99.22	72.0	22.0	93.3
Butterfly milkweed (ASTU)	98.37	50.5	40.0	89.0
Prairie coreopsis (COPA)	70.30	42.0	47.0	62.6
Pale purple coneflower (ECPA)	93.65	43.5	50.0	87.6
Rattlesnake master (ERYU)	95.78	24.5	71.0	91.5
Bottle gentian (GEAN)	75.83	3.5	82.0	64.8
Oxeye false-sunflower (HEHE)	99.84	71.0	19.0	89.9

- High dormancy in some grass species, and many forb species.
- High percentage of hard seed in legume species

**Table 1D:**  
**Sample Seed Test**

<b>SAMPLE SEED TEST, FRESH SEED</b>				
SPECIES				
<b>WILDFLOWERS</b>	<b>PURITY</b>	<b>GERM</b>	<b>DORMANT</b>	<b>PLS</b>
Rough blazing-star (LIAS)	98.41	36.0	61.0	95.5
Prairie blazing-star (LIPY)	98.28	3.5	92.5	94.3
Great blue lobelia (LOSI)	92.20	21.5	38.0	54.9
Wild bergamot (MOFI)	95.51	62.5	2.0	61.6
Wild quinine (PAIN)	96.13	81.0	10.0	87.5
VA Mountain mint (PYVI)	97.06	77.5	8.0	83.0
Hairy mountain mint (PYPI)	98.70	92.0	0.0	90.8
Slender mountain mint (PYTE)	95.03	75.5	11.0	82.2
Greyhead coneflower (RAPI)	98.68	89.5	0.0	88.3
Sweet coneflower (RUSU)	98.02	71.0	25.0	94.1
Rosinweed (SIIN)	81.03	40.0	54.5	76.6
Compass plant (SILA)	86.88	23.0	72.0	82.5
Stiff goldenrod (SORI)	95.31	60.0	22.0	78.2
Showy goldenrod (SOSP)	86.45	26.0	66.0	79.5
Bracted spiderwort (TRBR)	99.98	5.0	51.0	56.0
Ohio spiderwort (TROH)	99.76	6.0	74.0	79.8
Culver's root (VEVI)	93.04	22.0	37.5	55.4
Golden Alexander (ZIAU)	99.33	22.0	61.0	82.4

- High dormancy in some grass species, and many forb species.
- High percentage of hard seed in legume species

**Table 2D:**  
**Seeds Per Unit Weight**

A good estimate of seeds/oz or seeds/lb is critically important in calculating seed-ing rates. Seed count data is an approximation derived from counting out a small quantity of seed and weighing them, repeating the process a few times, and taking an average seed count per unit weight (800 seeds/gram, for example). This is then used to calculate seeds per ounce or seeds per pound. Variations in seed size, seed fill, and degree of cleaning can greatly affect the estimate. Hulls, awns, hairs, if left in place on the seed, will greatly reduce the number of seeds/lb as compared to the same seed when properly cleaned. This table lists published values of seed counts for the species listed. Prairie Moon Nursery, Winona, MN, publishes seed counts for a comprehensive list of species in their catalog each year. Their counts are based on seed lots deemed ‘typical’ for the native seed trade. Many of the actual seed count values have been adjusted down slightly (by .8 or .9 of the actual estimate) to give an approximation of ‘viable seed count’ per unit weight estimate, and so is a more conservative seed count. USDA PLANTS Database values, if available, are also listed. Large discrepancies in seed counts for a species are often inexplicable, but may reflect different degrees of cleaning (hulls, awns, pappus), larger seed size of ‘improved’ varieties, or even typographical errors.

SPECIES	Scientific Name	SEED WEIGHTS (Prairie Moon <sup>1</sup> )		USDA PLANTS <sup>2</sup>
		Seeds/Oz	Seeds/lb	Seeds/lb
<b>WILDFLOWERS</b>				
Canada anemone	<i>Anemone canadensis</i>	8000	128000	-
Thimbleweed	<i>Anemone cylindrica</i>	26000	416000	-
Prairie sage	<i>Artemisia ludoviciana</i>	250000	4000000	3,750,000
Butterfly milkweed	<i>Asclepias tuberosa</i>	4300	68800	70,000
Sky blue aster	<i>Aster azureus</i>	80000	1280000	-
Smooth blue aster	<i>Aster laevis</i>	55000	880000	1,014,000
New England aster	<i>Aster novae-angliae</i>	66000	1056000	1,100,000
Prairie coreopsis	<i>Coreopsis palmata</i>	10000	160000	-
Pale purple coneflower	<i>Echinacea pallida</i>	5200	83200	106,000
Rattlesnake master	<i>Eryngium yuccifolium</i>	7500	120000	177,000
Bottle gentian	<i>Gentiana andrewsii</i>	280000	4480000	9,000,000
Oxeye false-sunflower	<i>Heliopsis helianthoides</i>	6300	100800	154,000
Rough blazing-star	<i>Liatis aspera</i>	16000	256000	217,920
Blazing-star	<i>Liatis pycnostachya</i>	11000	176000	120,000
Great blue lobelia	<i>Lobelia siphilitica</i>	500000	8000000	-
Wild bergamot	<i>Monarda fistulosa</i>	70000	1120000	1,272,500
Wild quinine	<i>Parthenium integrifolium</i>	7000	112000	-

**Table 2D:  
Seeds Per Unit Weight**

SPECIES		SEED WEIGHTS (Prairie Moon <sup>1</sup> )		USDA PLANTS <sup>2</sup>
Common Name	Scientific Name	Seeds/Oz	Seeds/lb	Seeds/lb
<b>WILDFLOWERS</b>				
Hairy Mt. mint	<i>Pycnanthemum pilosum</i>	185000	2960000	-
Narrowleaved Mt. mint	<i>Pycnanthemum tenuifolium</i>	378000	6048000	-
Virginia Mt. mint	<i>Pycnanthemum virginianum</i>	220000	3520000	-
Greyhead coneflower	<i>Ratibida pinnata</i>	30000	480000	1,000,000?
Sweet coneflower	<i>Rudbeckia subtomentosa</i>	43000	688000	-
Rosinweed	<i>Silphium integrifolium</i>	1200	19200	-
Compass plant	<i>Silphium laciniatum</i>	660	10560	-
Stiff goldenrod	<i>Solidago rigida</i>	41000	656000	1,009,000
Showy goldenrod	<i>Solidago speciosa</i>	95000	1520000	-
Prairie spiderwort	<i>Tradescantia bracteata</i>	10000	160000	-
Ohio spiderwort	<i>Tradescantia ohioensis</i>	8000	128000	-
Culver's root	<i>Veronicastrum virginicum</i>	800000	12800000	-
Golden Alexander	<i>Zizia aurea</i>	11000	176000	-
<b>GRASSES-WARM</b>				
Big bluestem	<i>Andropogon gerardii</i>	10000	160000	144,240
Side-oats grama	<i>Bouteloua curtipendula</i>	6000	96000	191,000
Switchgrass	<i>Panicum virgatum</i>	14000	224000	259,000
Little bluestem	<i>Schizachyrium scoparium</i>	15000	240000	240,670
Indian grass	<i>Sorghastrum nutans</i>	12000	192000	174,720
Prairie cordgrass	<i>Spartina pectinata</i>	6600	105600	183,000
Tall dropseed	<i>Sporobolus asper</i>	30000	480000	759,362
Prairie dropseed	<i>Sporobolus heterolepis</i>	16000	256000	-

<sup>1</sup>Prairie Moon Nursery Catalog, Prairie Moon Nursery, Winona, MN [www.prairiemoon.com](http://www.prairiemoon.com).

<sup>2</sup>USDA-PLANTS DATA BASE <http://plants.usda.gov/>

**Table 2D:  
Seeds Per Unit Weight**

SPECIES		SEED WEIGHTS (Prairie Moon <sup>1</sup> )		USDA PLANTS <sup>2</sup>
Common Name	Scientific Name	Seeds/Oz	Seeds/lb	Seeds/lb
<b>GRASSES-COOL</b>				
Bluejoint grass	<i>Calamagrostis canadensis</i>	280000	4480000	3,837,472
Canada wildrye	<i>Elymus canadensis</i>	5200	83200	115,000
Virginia wildrye	<i>Elymus virginicus</i>	4200	67200	80,000
Junegrass	<i>Koeleria macanthra</i>	200000	3200000	2,315,000
<b>SEDGES</b>				
Prairie sedge	<i>Carex bicknellii</i>	17000	272000	-
Plains Oval Sedge	<i>Carex brevior</i>	29000	464000	-
Heavy sedge	<i>Carex gravida</i>	12000	192000	-
<b>LEGUMES</b>				
Canada milkvetch	<i>Astragalus canadensis</i>	17000	272000	120,000
Leadplant	<i>Amorpha canescens</i>	16000	256000	195,333
White wild indigo	<i>Baptisia alba</i>	1700	27200	-
Cream Wild Indigo	<i>Baptisia bracteata</i>	1400	22400	
White prairie clover	<i>Dalea candida</i>	19000	304000	-
Purple prairie clover	<i>Dalea purpurea</i>	18000	288000	300,000
Showy tick-trefoil	<i>Desmodium canadense</i>	5500	88000	88,000
Roundhead bush clover	<i>Lespedeza capitata</i>	8000	128000	275,000

- <sup>1</sup>Prairie Moon Nursery Catalog, Prairie Moon Nursery, Winona, MN [www.prairiemoon.com](http://www.prairiemoon.com).
- <sup>2</sup>USDA-PLANTS DATA BASE <http://plants.usda.gov/>

## Soil Moisture Requirements

The wetness ratings presented here are intended as a guide to the soil moisture requirements for the species listed, and should not be strictly equated to degrees of wetness required for seed production. Many obligate wetland species (-5 rating) occur in permanently or seasonally flooded wetlands. The facultative upland species (2-4 ratings) include a diverse collection of plants, some adapted to exist in a variety of environmentally stressful or disturbed sites (including wetlands). For definitions of the terms 'obligate' and 'facultative' see Table 2, Wetland Indicator Categories. See Table 3, Soil Moisture Characteristics, for definition of the terms 'xeric', 'mesic', and 'hydric' as relates to soil characteristics.

**Table 1. Wetness Rating\* (Coefficient of Wetness=CW)  
For North Central Region (IA, IL, IN, MI, MN, MO, WI)**

SPECIES		Wet-Dry
Common Name	Scientific Name	(-/+)
<b>GRASSES - WARM</b>		
Big bluestem	<i>Andropogon gerardii</i>	1
Side-oats grama	<i>Bouteloua curtipendula</i>	5
Switchgrass	<i>Panicum virgatum</i>	-1
Little bluestem	<i>Schizachyrium scoparium</i>	4
Indian grass	<i>Sorghastrum nutans</i>	2
Prairie cordgrass	<i>Spartina pectinata</i>	-4
Tall dropseed	<i>Sporobolus asper</i>	5
Prairie dropseed	<i>Sporobolus heterolepis</i>	4
<b>GRASSES - COOL</b>		
Bluejoint grass	<i>Calamagrostis canadensis</i>	-5
Canada wildrye	<i>Elymus canadensis</i>	1
Virginia wildrye	<i>Elymus virginicus</i>	-2
Junegrass	<i>Koeleria macanthra</i>	5
Porcupine grass	<i>Stipa spartea</i>	5
<b>SEDGES</b>		
Plains Oval Sedge	<i>Carex brevior</i>	0
Prairie Sedge	<i>Carex bicknelli</i>	1
<b>LEGUMES</b>		
Canada milkvetch	<i>Astragalus canadensis</i>	-1
Cream Indigo	<i>Baptisia bracteata</i>	5
White wild indigo	<i>Baptisia leucantha</i>	3
White prairie clover	<i>Dalea candida</i>	5
Purple prairie clover	<i>Dalea purpurea</i>	5
Showy tick-trefoil	<i>Desmodium canadense</i>	1
Roundhead bush clover	<i>Lespedeza capitata</i>	3
American vetch	<i>Vicia americana</i>	
<b>SHRUBS</b>		
Leadplant	<i>Amorpha canescens</i>	5
New Jersey tea	<i>Ceanothus americanus</i>	5

### KEY:

Wetland Indicator Categories	Wetness Rating (CW)
Upland	5
Facultative Upland-	4
Facultative Upland	3
Facultative Upland+	2
Facultative -	1
Facultative	0
Facultative+	-1
Facultative Wetland-	-2
Facultative Wetland	-3
Facultative Wetland+	-4
Obligate Wetland	-5

Ladd 1997, Vascular Plants of Midwestern Tallgrass Prairies, Appendix A in: The Tallgrass Restoration Handbook, Ed. Packard and Mutel.

Note: Regional Wetland Indicator Categories express the estimated probability (likelihood) of a species occurring in wetlands versus non-wetlands in the region.

## Soil Moisture Requirements Continued

SPECIES		Wet-Dry
Common Name	Scientific Name	(-/+)
<b>WILDFLOWERS</b>		
Canada anemone	<i>Anemone canadensis</i>	-3
Thimbleweed	<i>Anemone cylindrica</i>	5
Prairie sage	<i>Artemisia ludoviciana</i>	5
Butterfly milkweed	<i>Asclepias tuberosa</i>	5
Smooth blue aster	<i>Aster laevis</i>	5
New England aster	<i>Aster novae-angliae</i>	-3
Stiff coreopsis	<i>Coreopsis palmata</i>	5
Pale purple coneflower	<i>Echinacea pallida</i>	5
Rattlesnake master	<i>Eryngium yuccifolium</i>	-1
Bottle gentian	<i>Gentiana andrewsii</i>	-3
Oxeye false-sunflower	<i>Heliopsis helianthoides</i>	5
Rough blazing-star	<i>Liatris aspera</i>	5
Blazing-star	<i>Liatris pycnostachya</i>	1
Great blue lobelia	<i>Lobelia siphilitica</i>	-4
Wild bergamot (Horsemint)	<i>Monarda fistulosa</i>	3
Wild quinine	<i>Parthenium integrifolium</i>	5
Mountain mint	<i>Pycnanthemum virginianum</i>	-4
Slender mountain mint	<i>Pycnanthemum tenuifolium</i>	0
Hairy mountain mint	<i>Pycnanthemum pilosum</i>	5
Greyhead coneflower	<i>Ratibida pinnata</i>	5
Sweet coneflower	<i>Rudbeckia subtomentosa</i>	-3
Rosinweed	<i>Silphium integrifolium</i>	5
Compass plant	<i>Silphium laciniatum</i>	4
Stiff goldenrod	<i>Solidago rigida</i>	4
Showy goldenrod	<i>Solidago speciosa</i>	5
Bracted spiderwort	<i>Tradescantia bracteata</i>	4
Ohio spiderwort	<i>Tradescantia ohioensis</i>	5
Culver's root	<i>Veronicastrum virginicum</i>	0
Golden Alexander	<i>Zizia aurea</i>	-1

### KEY:

Wetland Indicator Categories	Wetness Rating (CW)
Upland	5
Facultative Upland-	4
Facultative Upland	3
Facultative Upland+	2
Facultative -	1
Facultative	0
Facultative+	-1
Facultative Wetland-	-2
Facultative Wetland	-3
Facultative Wetland+	-4
Obligate Wetland	-5

\*Ladd 1997, Vascular Plants of Midwestern Tallgrass Prairies, Appendix A in: The Tallgrass Restoration Handbook, Ed. Packard and Mutel.



**Table 2. Wetland Indicator Categories**

Indicator Code	Wetland Type	Comment
OBL	Obligate Wetland	Occurs almost always (estimated probability 99%) under natural conditions in wetlands.
FACW	Facultative Wetland	Usually occurs in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.
FAC	Facultative	Equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).
FACU	Facultative Upland	Usually occurs in non-wetlands (estimated probability 67%-99%), but occasionally found on wetlands (estimated probability 1%-33%).
UPL	Obligate Upland	Occurs in wetlands in another region, but occurs almost always (estimated probability 99%) under natural conditions in non-wetlands in the regions specified. If a species does not occur in wetlands in any region, it is not on the National List.

Notes: A positive (+) and negative (-) sign is used for facultative categories; (+) means more frequently found in wetlands, (-) means less frequently found in wetlands.

<http://plants.usda.gov/wetinfo.html#categories>

Accessed 12/8/06

**Table 3. Soil Moisture Characteristics**

GENERAL MOISTURE GRADIENT	SOIL CHARACTERISTICS
<b>XERIC</b>	Excessively drained, and somewhat excessively drained sandy or gravelly soils, or shallow loam soils on steep slopes and ridges  ↑  Well-drained and moderately well-drained loamy soils  ↓  Somewhat poorly drained, poorly drained, very poorly drained soils with standing water part or most of the year
↑ (dryer)	
<b>MESIC</b>	
(wetter) ↓	
<b>HYDRIC</b>	

This table is presented as a guide to soil moisture characteristics implied by the terms xeric, mesic, and hydric, as used in this manual.

This table shows relative degree of difficulty within the four main aspects of seed production for the species listed. This information is subjective, and is based upon seed production experience at the Tallgrass Prairie Center. Factors such as climate, soils, labor, equipment, and experience available to other producers will alter perceptions regarding difficulty of seed production. The information is presented here to help producers anticipate requirements for native seed production of these species.

Relative Degree of Difficulty for Seed Increase (by species)							8/22/2007
Common Name	Scientific Name	Mkt Price*	Ease of Propagation	Stand Mngmnt	Ease of Harvest	Cleanability /Yield	Relevant Comments:
(PLS lbs)							
<b>GRASSES - WARM</b>							
Big bluestem	<i>Andropogon gerardii</i>	\$10.00					Seed requires debearding
Side-oats grama	<i>Bouteloua curtipendula</i>	\$12.00					
Switchgrass	<i>Panicum virgatum</i>	\$10.00					
Little bluestem	<i>Schizachyrium scoparium</i>	\$12.00					Seed requires debearding
Indian grass	<i>Sorghastrum nutans</i>	\$12.00					Seed requires debearding
Prairie cordgrass	<i>Spartina pectinata</i>	\$120.00					Requires irrigation; Low seed yield
Tall dropseed	<i>Sporobolus asper</i>	\$45.00					
Prairie dropseed	<i>Sporobolus heterolepis</i>	\$150.00					Seed viability generally low
<b>GRASSES - COOL</b>							
Bluejoint grass	<i>Calamagrostis canadensis</i>	\$60.00 (oz)					Requires irrigation; tiny fluffy seed; low seed yield
Canada wildrye	<i>Elymus canadensis</i>	\$10.00					Long awns make combining, cleaning challenging
Virginia wildrye	<i>Elymus virginicus</i>	\$5.00					
Junegrass	<i>Koeleria macanthra</i>	\$120.00					Small seeded; poor competitor in mesic soils
Porcupine grass	<i>Stipa spartea</i>	\$120.00					Prolonged dormancy; difficult to handle, clean
<b>SEDGES</b>							
Prairie Sedge	<i>Carex bicknelli</i>	\$300.00					Low yield?
Plains Oval Sedge	<i>Carex brevior</i>	\$120.00					
<b>LEGUMES</b>							
Canada milkvetch	<i>Astragalus canadensis</i>	\$60.00					Stand very short-lived
Cream Indigo	<i>Baptisia bracteata</i>	\$200.00					Low statured plant; low yield
White wild indigo	<i>Baptisia leucantha</i>	\$120.00					Good seed germination can be difficult to achieve
White prairie clover	<i>Dalea candida</i>	\$30.00					
Purple prairie clover	<i>Dalea purpurea</i>	\$60.00					
Showy tick-trefoil	<i>Desmodium canadense</i>	\$5.00					Seeds cling together
Roundhead bush clover	<i>Lespedeza capitata</i>	\$120.00					
<b>SHRUBS</b>							
Leadplant	<i>Amorpha canescens</i>	\$180.00					Min. three years first crop; hand harvest
New Jersey tea	<i>Ceanothus americanus</i>	\$750.00					Difficult to germinate; min. three years first crop

Relative Degree of Difficulty for Seed Increase (by species) Continued

Common Name	Scientific Name	Mkt Price* (per ounce)	Ease of Propagation	Stand Mngmnt	Ease of Harvest	Cleanability /Yield	Relevant Comments:
<b>WILDFLOWERS</b>							
Canada anemone	Anemone canadensis	\$15.00					Difficult to germinate (double dormancy)
Thimbleweed	Anemone cylindrica	\$60.00					Low yield; cottony seeds difficult to clean
Prairie sage	Artemisia ludoviciana	\$30.00					Very tiny seeds; short stand life
Butterfly milkweed	Asclepias tuberosa	\$20.00					Hand harvest as pods ripen; challenging to clean
Smooth blue aster	Aster laevis	\$15.00					
New England aster	Aster novae-angliae	\$10.00					Tiny seeds; difficult to harvest and clean
Stiff coreopsis	Coreopsis palmata	\$15.00					Difficult to clean
Pale purple coneflower	Echinacea pallida	\$5.00					
Rattlesnake master	Eryngium yuccifolium	\$6.00					
Bottle gentian	Gentiana andrewsii	\$30.00					Hand harvest over time; small papery seeds
Oxeye false-sunflower	Heliopsis helianthoides	\$2.00					
Rough blazing-star	Liatris aspera	\$25.00					
Blazing-star	Liatris pycnostachya	\$15.00					
Great blue lobelia	Lobelia siphilitica	\$15.00					Irrigation; Very tiny seeds; hand harvest
Wild bergamot (Horsemint)	Monarda fistulosa	\$8.00					
Wild quinine	Parthenium integrifolium	\$15.00					
Hairy mountain mint	Pycnanthemum pilosum	\$12.00					
Slender mountain mint	Pycnanthemum tenuifolium	\$20.00					
Mountain mint	Pycnanthemum virginianum	\$30.00					
Greyhead coneflower	Ratibida pinnata	\$3.00					
Sweet coneflower	Rudbeckia subtomentosa	\$8.00					
Rosinweed	Silphium integrifolium	\$8.00					Low yield
Compass plant	Silphium laciniatum	\$6.00					Min. three years first crop; Low yield; Diff. to clean
Stiff goldenrod	Solidago rigida	\$4.00					
Showy goldenrod	Solidago speciosa	\$20.00					Small seeds; dispersed immediately
Bracted spiderwort	Tradescantia bracteata	\$30.00					Plants wither to ground soon after seed ripe
Ohio spiderwort	Tradescantia ohioensis	\$20.00					Seed shatters as it ripens, long flowering period
Culver's root	Veronicastrum virginicum	\$25.00					Very tiny seeds
Golden Alexander	Zizia aurea	\$6.00					

\*Mkt (Market) Price is based on Prairie Moon Nursery Catalog and Cultural Guide 2007. This information is presented here simply to show relative retail market value of the species listed and does not reflect wholesale prices or competitive bidding prices.

**\*KEY: Relative Degree of Difficulty for Seed Increase**

	Easy to Moderately easy	Moderately Difficult to Difficult	Challenging to Very Challenging
<b>Ease of Propagation</b>	Can be direct seeded	Best to greenhouse grow	Low germination, and/or pro-longed dormancy
<b>Stand Mngmnt</b>	Long-lived and/or competitive with weeds, or herbicides available	Short-lived and/or non-competitive and/or requires weed barrier	Stand very short-lived and/or requires supplemental irrigation
<b>Ease of Harvest</b>	Can be mechanically harvested	Hand harvest and/or tiny seeds; or difficult to combine	Hand harvest over time and/or seed shatters immediately as it ripens
<b>Cleanability/Yield</b>	Only requires air-screen cleaning; good yield	Requires some degree of pre-cleaning; and/or low yield	Difficult to clean, and/or very low yield.

\*See specific factors listed under 'Relevant Comments' in table.