

## **Development of a Prairie Junegrass Release for the Northern Great Plains**

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### **ABSTRACT**

Prairie junegrass [*Koeleria macrantha* (Ledeb.) Schult.] is a cool season, perennial bunch grass. It is adapted to a wide range of climates and soils. Active growth begins very early in the spring, providing good forage for livestock, and wildlife. It is useful for revegetation of various disturbed sites. Currently no adapted cultivar of prairie junegrass is available for conservation plantings in the Northern Great Plains. The purpose of this study was to evaluate, identify, assemble, and develop a release. Seed was collected in 2006 and 2007 from native stands in South Dakota, North Dakota, and Minnesota. Each of the 97 collections was assigned an identification number (accession), propagated in the greenhouse and assembled into replicated three-plant plots at the USDA Natural Resources Conservation Service Plant Materials Center in Bismarck, ND. Leafiness, height and culm production were rated in 2010. In 2012, most plants in the assembly were dead. The reason for mortality is not clearly known. Seed was collected from the remaining live plants and bulked together. Currently it is stored in a cooler at the Bismarck Plant Materials Center. The seed is available in small quantities for research purposes. Seed is also available in very small amounts from some of the individual native collections for further evaluation.

### **INTRODUCTION**

Prairie junegrass [*Koeleria macrantha* (Ledeb.) Schult.] is a short, cool season, perennial bunch grass that is distributed in Europe, Asia, North America and various other locations throughout the world (Dixon 2000). In North America, distribution of the species ranges from eastern Alaska through California into Mexico and east to Alabama, Delaware, and Ontario. It is most commonly found on rocky to sandy loam soils of low fertility but also occurs on clay bearing soils with adequate drainage. It grows in semi-arid to mesic conditions, on dry prairies, or in grassy woods in sandy soils (Barkworth et. al. 2007). It can become abundant in the northern plains mixed prairie. It is useful in seed mixes for restoration of native prairies as it has good drought tolerance and fibrous roots that are beneficial for revegetation of various disturbed sites. Active growth begins very early in the spring, providing early forage for livestock, and wildlife (USDA 2006). The only known releases include 'Barkoel' and 'Barleria' from Holland (Clark and Watkins 2010), and 'Ilo' from Estonia (Soovali and Bender 2006). Obtaining seed for these releases from U.S. seed vendors can be difficult. Currently no adapted cultivar of prairie junegrass is commercially available for conservation plantings in the Northern Great Plains. The purpose of this study was to assemble native seed collections of prairie junegrass from states in the Northern Great Plains region and evaluate and select ones with superior traits in an effort to develop a prevarietal or cultivar release for conservation plantings in the Northern Great Plains.

## MATERIALS AND METHODS

Seed heads were hand clipped from native stands in Minnesota, North Dakota, and South Dakota in 2006 and 2007. There were 97 collections made from various soil and environmental conditions (Table 1). Seed was planted in 2008 into soilless potting mix in Ray Leach containers in the greenhouse. Seedlings were transplanted to field plots May 21, 2008 at the Bismarck Plant Materials Center (PMC) on a Mandan silt loam. Three plant plots of each accession were arranged in a randomized complete block design with three replications, except when seedlings of an accession were limited. Spacing between rows and between each plant was 42 inches (Figure 1).

In 2009, superior plants were noted for growth habit and potential in landscaping, prairie range seedings or both. In 2010, plants were rated for height, number of culms, leafiness, and growth stage. In 2011, plants that were dead, had poor vigor, or flowered very early or late were removed from the field. Observations in the spring of 2012 showed most plants were dead. A small amount of seed produced from remaining plants was harvested as a composite. Seed was cleaned using a fanning mill.

Maintenance was by shallow tilling between rows and hand hoeing. Plant residue was removed in 2011 by early fall mowing. No herbicide or fertilizer was applied in any year. Irrigation was applied after planting in 2008 to fill air spaces left after hand planting with a dibble bar.

**Table 1. Origin information of prairie junegrass *Koeleria macrantha* collections, Plant Materials Center, Bismarck, North Dakota**

Accession	Collector	Date	State	County	Location	Other
9092070	Knudson, Aune	7/19/06	ND	Ward	SE1/4SW1/4 sec 2, T152N, R84W	
9092071	D. Tober	8/16/06	ND	Oliver	MLRA 54, Arroda Lakes GMA	
9092072	D. Tober	8/16/06	ND	Dunn	1/2 mi. W. of Little Missouri State Park Headquarters	
9092073	A. Berg	8/4/06	ND	Bowman	sec 22, T130N, R104W	S exp., MLRA 54, cobbart compl.
9092074	D. Teske	7/19/06	ND	Sioux	sec 22, T129N, R83W	Daglum soils
9092075	D. Teske	7/17/06	ND	Sioux	sec 9, T132N, R79W	Prairie Knight Casino entrance
9092076	Anderson, Simonsen	7/11/06	ND	Stutsman	sec 2, T141N, R64W	
9092077	C. Roth	6/27/06	ND	Bottineau	sec 16, T162N, R 75W	
9092078	L. Huether	7/5/06	ND	Mountrail	sec 35, T 92N, R 154W	Fred Evans, native range
9092079	L. Huether	7/5/06	ND	Mountrail	sec 17, T 92N, R 157W	Dustin Roise, lightly grazed
9092080	S. Sieler	7/20/06	ND	McLean	SE1/4 sec 16, T 147N, R 79W	MLRA 53B, state school land
9092081	S. Sieler	7/20/06	ND	McLean	SW1/4 sec 16, T 149N, R 79W	state school land
9092082	W. Duckwitz	7/25/06	ND	Grant	S1/2 sec 14, T 135N, R 88W	Heart Butte Dam, hilltop (2 samples)
9092083	Area 1-Thief River FO	7/20/06	MN	Kittson	Norway Dunes TNC, 4 mi to Halma	north end of unit
9092084	D. Teske	7/12/06	ND	Sioux	N1/2 NW1/4 sec 36, T 131N, R 84W	
9092085	D. Tober, R. Jones	7/21/06	ND	Wells	8 mi N. of Hurdsfield, Wells Co. GMA	
9092086	D. Teske	7/12/06	ND	Sioux	SW NE1/4 sec 27, T 130N, R 83 W	
9092087	L. Huether	7/5/06	ND	Mountrail	sec 20, T92N, R154W	
9092088	L. Huether	7/5/06	ND	Mountrail	sec 30, T 92N, R 156W	Curt Trulson land
9092089	L. Huether	7/5/06	ND	Mountrail	sec 21, T 92N, R 159W	Denny Farhart
9092090	W. Duckwitz	6/29/06	ND	Morton	NE1/4 sec 1, T82N, R 140W	north of buildings
9092091	R. Jones	7/25/06	ND	Morton	sec 16, T 139N, R 85W	right behind New Salem Sue

**Table 1. Origin information of prairie junegrass *Koeleria macrantha* collections, Plant Materials Center, Bismarck, North Dakota (continued)**

Accession	Collector	Date	State	County	Location	Other
9092092	Forman, Gustafson	7/10/06	ND	Rolette	SE1/4 NW1/4 sec 1, T160N, R 72W	
9092093	D. Teske	7/8/06	ND	Morton	SW SW1/4, sec 14, T138N, R 81W	Teske acreage, Co. Rd. 138
9092094	D. Teske	8/7/06	SD	Corson	sec 13-T20-R27 by EQIP well/tank site	Reeder Loam
9092095	Jensen, Bergsagel	8/9/06	SD	Spink	N1/2 sec 21, T116N, R 65W	Bald Mtn. near Redfield (2 samples)
9092096	D. Teske	7/18/06	SD	Corson	SE1/4 sec 9, T18N, R 21E	Cottonwood Creek
9092097	Jensen, Bergsagel	8/10/06	SD	Deuel	NE1/4 sec 16, T116N, R49W	8 mi N. of Clear Lake along GMA fence
9092098	Jensen, Bergsagel	8/9/06	SD	Faulk	sec 28, 33 T117N, R69W	8 mi south Faulkton
9092099	Jensen, Bergsagel	8/10/06	SD	Codington	sec 13, T119N, R51W	along Hwy 20
9092100	Yapp, Schoon	7/12/06	SD	Todd	SE Harrington, 5 mi, 20 mi SW of Rosebud	
9092101	Teske	7/18/06	SD	Corson	SE1/4 sec 8, T18N, R21E	Cottonwood Creek
9092102	Woods, Sommer	7/11/06	SD	Hutchinson	sec 9, T99N, R57W	Harvey Wall, owner
9092103	R. Jones	7/18/06	MN	Ottertail	Inspiration Peak, 12 mi NE of Ashby	
9092104	Rennolet, Woods	7/11/06	SD	Hutchinson	8 mi SE of FO, Dennis Farst, landowner	(2 samples)
9092105	R. Jones	7/17/06	MN	Clay	TNC Bluestem Prairie, 10 mi E. of Moorhead	
9092106	S. Runyan	7/7/06	SD	Hyde	sec 6, T111N, R72W	section line fence
9092107	Jensen, Harding 4-H	7/10/06	SD	Harding	North Cave Hills	
9092108	R. Jasken	summer 06	MN	Becker	sec 18, T142N, R41W	
9092109	Hanson, Bronder	7/14/06	MN	Sherburne	SW1/4 SW1/4 sec 26, T34N, R27W	
9092110	R. Jones	7/18/06	MN	Douglas	TNC Seven Sisters, 3 mi E of Ashby	
9092111	D. Tober	7/24/06	MN	Pope	Ordway Prairie TNC, 9 mi SE of Brooten, MN	NE of rest stop
9092112	Area 1-Thief River FO	7/20/06	MN	Kittson	Norway Dunes TNC, 4 mi to Halma	south end of unit
9092113	L. Alveshere	7/18/06	ND	McKenzie	NENW sec 15, T152N, R101W	Donald Lindvig
9092114	Blessum, Forman	7/5/06	ND	McHenry	sec 15, T157N, R78W	
9092115	L. Alveshere	8/16/06	ND	McKenzie	NENE sec 16, T149N, R99W	Gene Traustrom
9092116	Jones, Tober	7/20/06	MN		Agassiz Dunes TNC 3 mi S. of Fertile	
9092117	L. Alveshere	7/19/06	ND	McKenzie	SWNE sec 25, T149N, R 95W	Arnold Peterson
9092118	L. Alveshere	7/6/06	ND	McKenzie	SESE sec 5, T150N, R96W	Tank Ranch
9092119	L. Alveshere	7/24/06	ND	McKenzie	NESE sec 19, T146N, R103W	John Quinnel, Milt Madison
9092120	Gustafson, Jones	7/20/06	MN		Skull Lake WMA 14 mi N. of Lake Bronson	
9092121	D. Tober	9/26/06	ND	Burleigh	McDowell Dam	from 15 plants
9092123	D. Tober	9/26/06	ND	Stutsman	10 mi N. Medina, WPA, W. side of highway	
9092124	D. Tober	9/12/06	MN	Big Stone	4 mi W. of Beardsley Paradise Retreat Dev.	
9092125	D. Tober	9/26/06	ND	Burleigh	WMA N. of Apple Valley Housing Dev.	
9092126	D. Tober	10/2/06	ND	Grant	across from Crappie Creek, Lake Tschida	
9092133	M. Rose	7/25/06	MN	Renville	sec 21, T113N, R35W Cnty. Rd. 15	native bedrock, MN River
9092134	M. Rose	7/25/06	MN	Redwood Falls	NE1/4 sec 23, T112N, R34W	native pasture (rock outcrops)
9092135	L. Voigt	7/3/06	ND	Dunn	SWNE sec 30-T147-R93,w. saltbox	Andrew Voigt Ranch
9092136		7/24/06	SD	Brown	SW sec 2-T125-R63	1330 ft. elev. Slope 2%

**Table 1. Origin information of prairie junegrass *Koeleria macrantha* collections, Plant Materials Center, Bismarck, North Dakota (continued)**

Accession	Collector	Date	State	County	Location	Other
9092177	D. Tober	8/31/07	ND	Ransom	Sheyenne National Grasslands, north trail	147th Ave.(co.53) 2 mi N. of Hwy 27
9092178	D. Tober	8/31/07	ND	Ransom	S. of McLeod approx. 1 mi.,Sheyenne Grasslands	west side of gravel road
9092179	D. Tober	8/30/07	MN	Pope	near Ordway Prairie SNA, TNC	W. of Brooten 7 mi.
9092180	D. Tober	8/30/07	MN	Polk	near Agassiz Dunes SNA, TNA	
9092181	D. Tober	8/30/07	MN	Clay	Regional Science Center	4 mi. E. of Glyndon
9092182	D. Tober	9/26/07	WY	Cook	NFS campgrounds, 3 mi NE of Sundance, WY	BHNF trailhead Bear Lodge Mtn.
9092183	D. Tober	9/26/07	WY	Cook	Bear Lodge Mtn. BHNF Cook Lake Rec. Area	1 mi down Cliff Swallow Trail
9092184	D. Tober	9/26/07	WY	Cook	3mi. S. of Beulah, WY Sand Creek Access	
9092185	D. Tober	9/26/07	WY	Cook	Bear Lodge Mtn. BHNF Warren Peak Lookout Tower 6656'	
9092186	D. Tober	9/26/07	WY	Cook	4 mi NW Sundance, BHNF Bearlodge Mtn.	Reuter Trailhead
9092187	D. Tober	9/28/07	ND	Dunn	1/4 mi S. from maintenance sign to Killdeer Mtns	GMA west side of road
9092188	D. Tober	9/25/07	SD	Meade	summit of Bear Butte E. of Sturgis	N. facing slope
9092189	D. Tober	9/25/07	SD	Meade	2/3 up Bear Butte, E. of Sturgis north facing slope	4200 ft
9092190	D. Tober	9/27/07	ND	Slope	near entrance to Burning Coal Vein, in pines	
9092191	D. Tober	9/27/07	ND	Slope	12 mi W. of Amidon on Burning Coal Vein Rd.	
9092192	D. Tober	9/27/07	ND	Billings	S. of Medora along Little Missouri River bank	
9092193	D. Tober	9/27/07	SD	Harding	Slim Butte Rest Stop, USFS	Hwy 20 W of Reva, SD
9092194	M. Knudson	8/12/07	ND	Slope	sec 25-T134N-R101W	N side of White Butte
9092195	D. Teske	7/12/07	ND	Sioux	sec 26&27-T130-R83	6 mi. W of Selfridge
9092196	C. Dixon	7/1/07	ND		Sully's Hill Native Prairie	
9092197	M. Bellon	7/15/07	ND	Burleigh	sec. 17- T138N-R79W 1 mi south of Lincoln Rd.	1.5 mi E.
9092198	W. Duckwitz	9/6/07	ND	Stark	NE1/4NE1/4sec 16-T141-R91	Rick Schwartz land
9092199	C.Stange, W.Duckwitz	9/6/07	ND	Stark	SW1/4SE1/4 sec 4-T141-R91	Rick Schwartz land
9092200	D. Granbois	8/27/07	SD	Brookings	NE1/4 sec.18-T112N-R47W	Lake Hendricks Township
9092201	J. Dylla, V. DeVine	8/29/07	SD	Clark	Sec 1-T118-R56	
9092202	Yankton FO	7/1/07	SD	Yankton		
9092203	A. Boltjes	7/19/07	SD	Hyde	sec16-T115N-R73W	
9092204	L. Schoon	8/23/07	SD	Todd	SW1/4 sec10-T38N-R33W	Elk Valley, Inc.
9092205	N. Jensen, D. Tober	7/23/07	SD		Emergency Spillway W. of Oahe Dam	northwest of Pierre, SD
9092206	N. Jensen, D. Tober	7/24/07	SD		Sage Creek Road, SD Badlands	
9092207	L. Schoon	8/15/07	SD	Todd	SW1/2 29-T36N-R25W	Casey Foster Land, sands
9092208	D. Blaha	8/1/07	SD	Sully	sec. 26 T116N-R80W	0.5 mi SE of river
9092209	T. Heck	8/1/07	SD	Potter	sec. 28-T117N-R79W	adj to north facing riparian area
9092210	B Woods, T. Sommer	7/13/07	SD	Hutchinson	sec. 31-T99-R58	south of barn
9092211	D.Tober, M. Knudson	10/11/07	MT	Powder River	2 mi. W of Diamond Butte Lookout, W. of Broadus	
9092214	M. Falk	8/24/07	SD	Hand	sec 9-T116-R67	silt loam, 0-2% slope
9092225	Paul Hoversten	9/1/07	MN	Lyon	E1/2 NE1/4 Sec 22 Island Lake Township	



## RESULTS AND DISCUSSION

Seedlings of prairie junegrass remained small after three months of growing in the greenhouse. Transplanting of seedlings was very successful. Survival was greater than 90 percent after the first year. There was a wide variability of growth forms among and within accessions. Height, leafiness, and hairiness are some of the variable attributes. Data was collected for each plant on June 7, 2010 (data not shown). Height, number of culms, and leafiness were rated on a scale of 1-3 with 1 being the best. Growth stage was also noted. Mortality of the stand in 2012 was unexpected and is not understood. Improper timing of residue removal in the fall of 2011 followed by a cold winter with lack of snow cover may have contributed to death of the plants. Prairie junegrass can become infected with various diseases including powdery mildew, rusts and leafspot (Soovali and Bender 2006, Dixon 2000). It is not known if the PMC assembly was infected or if mortality was related to a disease. The clean bulk seed amount after harvesting and cleaning the seed of the remaining remnant plants was 0.29 pounds.

A solid turf has formed after four years of seed shedding from remaining remnant plants. Prairie junegrass appears to reseed itself and form a turf with bare ground and favorable climatic conditions.

Seed fill can be difficult to determine in prairie junegrass.

## CONCLUSION

An assembly of 97 prairie junegrass collections from the Northern Great Plains were evaluated for leafiness, height, and number of culms. Severe mortality in 2011-2012 prevented further selection work; thus, the effort to develop a junegrass for the Northern Great Plains was discontinued. Seed from surviving plants was bulked together and is available for further evaluation as well as seed from some of the original collections. Seed quantities are very limited.

## LITERATURE CITED

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