



## Prairie Sandreed Assembly and Evaluation for Conservation Use in the Northern Great Plains

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### ABSTRACT

Prairie sandreed [*Calamovilfa longifolia* (Hook.) Scribner] is a tall, warm-season, sod-forming, native perennial grass. It is most abundant on sandy soils. It is fair for forage and hay, even with its coarse textured leaves and stems. Species adapted to sandy soils in the Northern Great Plains are limited. The original objective of this study was to develop a genetically diverse prairie sandreed release that had improved resistance to foliar diseases over the current cultivars adapted to Minnesota, North Dakota, and South Dakota, particularly when planted in the higher rainfall areas of the three states. Wildland seed collections from thirty eight sites were made across North Dakota, South Dakota, and Minnesota. The initial evaluation assembly was planted at the USDA, NRCS Plant Materials Center (PMC) in Bismarck, North Dakota. It consisted of seedlings propagated from the wildland collections, the cultivar ‘Goshen’ and the informal release ND-95. Although adapted, Koch Germplasm was not available when the assembly was planted. In 2008, a decision was made to select only Minnesota origin plant material from the initial collections. As foliar and leaf diseases are most prevalent in higher rainfall and humidity areas, it was surmised that plants originating from these locations would be the most resistant and adapted for use in locations with similar conditions. Seven Minnesota accessions displayed minimal leaf and stem disease, were the most vigorous, and produced seed. Additional testing and comparison of the seven accessions that comprised the Minnesota population was discontinued before a release was developed due to time restraints and limited interest in a new release or cultivar. A limited amount of seed harvested from a crossing block of the Minnesota accessions are available from the Bismarck, North Dakota PMC for further testing and research.

### INTRODUCTION

Prairie sandreed is naturally found on the drier prairies of the interior plains, from southern Canada to northern New Mexico and southern Arizona. It also grows as a minor species in Washington, Wisconsin, Michigan, and Missouri (Barkworth et al., 2007). Although prairie sandreed grows in a wide range of soils, it is well adapted and most abundant on sandy soils and sandy range sites (Hanson and Whitman, 1938; Masters et al., 1990; Larson and Johnson, 1999; Tober and Chamrad, 1992). Prairie sandreed produces long, deep rhizomes (Brejda et al., 1989) that are beneficial in soil stabilization. Prairie sandreed is coarse and stemmy. Its palatability is fair throughout spring and decreases as it matures. While prairie sandreed is valued as an inferior to fair forage during the growing season, it provides an important source of winter feed for cattle, horses, and domestic sheep. (Burzlaff, 1971).

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Foliar diseases on prairie sandreed are caused by various organisms, including *Stagonospora* and *Puccinia* (Univ.III Ext., 1991; Mankin, 1969; Vogel, 1996). These diseases can greatly reduce vigor and growth of the plants.

Development of a prairie sandreed release adapted to Minnesota, South Dakota, and North Dakota (particularly the moister areas of each state) that displays fewer leaf and stem diseases than currently available cultivars or releases was the objective of the study.

## MATERIALS AND METHODS

Wildland seed collections were made in the fall of 2003 from thirty-eight locations throughout Minnesota, and central and eastern South Dakota and North Dakota. Each wildland collection (accession) was from ten or more plants. Seed collections were propagated in the greenhouse in early 2004 and seedlings were space planted on July 6, 2004 to an initial evaluation plot at the Bismarck, North Dakota PMC on a Mandan silt loam. ‘Goshen’ and ND-95 were planted for comparison in the initial assembly. ‘Goshen’ was developed by the PMC in Bridger, Montana from plant material collected in eastern Wyoming. ND-95 is an informal release developed by the PMC at Bismarck, North Dakota from plant material with southwestern North Dakota origins. The initial evaluation consisted of three plants of each accession in a randomized complete block design with three replications. Plants were spaced 42 inches apart. Data was collected in August from 2005-2007 and included culm height, vegetative height, basal spread, and leaf width. Ratings on a 1-9 scale (1=best, 9=poorest) were made at the same time for leafiness, disease, seed culms, vigor, lodging, and plant size. In 2008, the accessions from Minnesota that previously scored best for disease resistance and overall plant performance were selected as the breeder population (Table 1).

Table 1. Wildland collection sites of prairie sandreed breeder population accessions.

Accession	State	County	Location
9082788	MN	Sherburne	24-T34N-R29W
9082814 <sup>1/</sup>	MN	Polk	Agassiz Dunes
9082815 <sup>1/</sup>	MN	Norman	Prairie Smoke Dunes
9082818	MN	Douglas	Lake Christina
9082820	MN	Chisago	8-T33N-R21W

<sup>1/</sup> Two plants of the accession were selected for inclusion into the breeder population.

Forage was sampled on July 22, 2008 from the Minnesota origin plants. Plants were at late boot to pre-anthesis growth stage. Twenty stems from the middle of each plant were cut and the leaves were clipped from the top five nodes of each stem. The leaf material was analyzed by the Oscar Olson Biochemistry Laboratories at South Dakota State University, Brookings. Forage quality estimates were similar among accessions and consisted of crude protein, acid detergent fiber, neutral detergent fiber, relative feed value and relative feed quality (Table 2).

In 2009 and 2010, portions of the roots and rhizomes of the Minnesota origin plants were dug from the initial evaluation plot, propagated in the greenhouse and randomly planted to a field plot. There were approximately 30-50 plants propagated for each of the seven selections. This was designated the breeder population. Seed was harvested from the breeder population from 2011-2016. The breeder block was destroyed in 2017. A trial to compare the selected breeder

population to the releases ‘Goshen’, ND-95, Koch Germplasm and ‘Pronghorn’ was planted in 2014 and 2015. Stands were not established due to severe weed problems and seeding equipment challenges. The study was discontinued before additional cultivar comparison trials could be planted.

Table 2. Forage quality of prairie sandreed leaf material collected on July 22, 2008 from breeder population accessions growing at Bismarck, North Dakota.

Accession	CP <sup>1/</sup>	ADF <sup>2/</sup>	NDF <sup>3/</sup>	RFV <sup>4/</sup>	RFQ <sup>5/</sup>
9082788	14	41	75	71	89
9082814	16	36	69	83	127
9082815	15	40	70	77	100
9082815	14	39	71	77	110
9082818	16	38	72	77	102
9082820	14	36	66	87	129

1/crude protein, 2/acid detergent fiber, 3/neutral detergent fiber, 4/relative feed value, 5/relative feed quality.

## RESULTS AND DISCUSSION

Germination and growth was slow in the greenhouse for the wildland seed collections. Rhizomes and roots collected from the Minnesota origin plants that became the breeder population were also slow to grow in the greenhouse. The smaller root and rhizome material was the easiest to propagate. The amount of leaf and stem disease varied among each plant and each accession when planted in the same environment at the Bismarck PMC. Some plants from the same accession in the initial evaluation plot were quite diverse in their growth habit. Two plants from accessions 9082814 and 9082815 were selected as part of the breeder population because of their differences. Seven plants, which originated from five wildland seed collections, were selected from the initial evaluation and designated as the breeder population (Table 1).

Vigor, leafiness and lack of disease were good to fair for all plants (Table 3). Weather appeared to influence the amount of disease visually observed each year. In wetter, more humid years, disease was more noticeable. It is expected there would be more disease if the breeder population was planted in a wetter or more humid environment. Seed of the breeder population was not planted for evaluation. Because prairie sandreed is cross pollinated, offspring may perform differently in growth and disease resistance than the parent plants.

## CONCLUSION

Definite differences exist in performance and disease tolerance among plants of prairie sandreed. This study was discontinued before collecting enough data to support or refute the need for an additional prairie sandreed release for the Northern Great Plains. Although information was recorded on the selected parent plants, no information was gathered on the offspring, which would be the breeder seed used for planting. Additional information is needed for plant performance on sandy soils and wetter environments than those found at the PMC at Bismarck, North Dakota. Trials to compare the breeder population and currently available

cultivars/releases of prairie sandreed are also needed. Seed produced from natural cross pollination of the selected Minnesota accessions is available to researchers for further study.

### LITERATURE CITED

- Barkworth, M.E., L.K. Anderton, K.M. Capels, S. Long, and M.B. Piep (Eds.). 2007. Manual of grasses for North America. Intermountain Herbarium and Utah State Univ. Press, Logan, UT. p. 219.
- Brejda, J.J., L.E. Moser and S.S. Waller. 1989. Rhizome and tiller development of three Nebraska Sandhills warm-season grasses. In: Proceedings of the Eleventh North American Prairie Conference, Lincoln, NE August 7-11 August 1988. NAPC, Lincoln, NE 1989. p. 211-215. <http://digitalcommons.unl.edu/napcproceedings/22>.
- Burzlaff, D.F. 1971. Seasonal variations of the in vitro dry-matter digestibility of three Sandhill grasses. *J. Range Manage.* 24:60-63.
- Hanson, Herbert C., Warren Whitman. 1938. Characteristics of major grassland types in Western North Dakota. *Ecol. Monographs* Vol 8, Issue 1 (Journal Series 25) 57-114
- Larson, G. E. and J.R. Johnson. 1999. Plants of the Black Hills and Bear Lodge Mountains. South Dakota State University College of Agriculture and Biological Sciences South Dakota Agricultural Experiment Station B732 p. 396
- Mankin, C.J. 1969. Diseases of grasses and cereals in South Dakota. SDSU Agricultural Experiment Station Tech. Bull. 35. June 1969. pp 1-28.
- Tober, Dwight A. and A. Dean Chamrad. 1992. Warm-season grasses in the Northern Great Plains. *Rangelands*: 14(4): 227-230.
- University of Illinois Extension. 1991. Stagonospora leaf spot or blotch of forage grasses. Disease Report on Plant Disease RPD No. 312. May 1991.
- Vogel, K.P., L.C. Newell, E.T. Jacobson, J.E. Watkins, P.E. Reece, and D.E. Bauer. 1996. Registration of 'Pronhorn' prairie sandreed grass. *Crop Sci.* 36:1712.

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Table 3. Comparative performance of prairie sandreed accessions 2005-2007. USDA-NRCS Bismarck, North Dakota.

Accession	Evaluation date	Culmht <sup>1/</sup>	Veg. ht <sup>2/</sup>	Basal sprd <sup>3/</sup>	Leaf width <sup>4/</sup>	Leaf <sup>5/</sup>	Dis <sup>6/</sup>	Seed culm <sup>7/</sup>	Culm no. <sup>8/</sup>	Vigor <sup>9/</sup>	Lodge <sup>10/</sup>	Size <sup>11/</sup>
		-----in.-----										
9082788	08/26/05	34	18	8	2	3	2		3	4		
9082788	08/04/06	69		26	3	2		1				
9082788	08/07/07					1	1	1			2	1
9082814	08/26/05	73	13	7	3	2	2		17	3		
9082814	08/04/06	77		26	1	2		1				
9082814	08/07/07					1	1	2			3	1
9082814	08/26/05	47	16	10	2	4	3		2	4		
9082814	08/04/06	54		16	2	2		2				
9082814	08/07/07					2	1	1			2	2
9082815	08/26/05	42	5	3	3	6	2		3	5		
9082815	08/04/06	49		14	1	2		2				
9082815	08/07/07					1	1	2			1	2
9082815	08/26/05	0	20	6	3	5	4		0	5		
9082815	08/04/06	45		14	2	1		3				
9082815	08/07/07					1	1	2			1	2
9082818	08/26/05	46	9	9	2	4	5		8	4		
9082818	08/04/06	52		20	2	2		1				
9082818	08/07/07					1	1	1			1	2
9082820	08/26/05	48	26	9	2	3	2		4	3		
9082820	08/04/06	60		18	2	2		3				
9082820	08/07/07		18		2	2	1	3	3	4	2	2

1/ Culm ht = culm height; 2/ Veg. ht = vegetative height; 3/ Basal sprd = Basal spread; 4/Leaf width; 1 = narrow, fine; 3 = wide, coarse  
 5/ Leaf = Leafiness; 2005 1 = many leaves; 9 = few or none; 2006-2007 1 = many; 3 = few or none; 6/ Dis = Disease; 1 = none; 3 = severe;  
 7/ Seed culm - 1 many; 3 = severe; 8/ Culm no. = Culm numbers 1 = many; 3 = few or none; 9/ Vigor = 1 = excellent; 9 = poor or dead;  
 10/Lodge = 1 = none; 3 = severe; 11/ = Size 1 = large, robust; 3 = small.

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