



United States
Department of
Agriculture

Natural
Resources
Conservation
Service

Plant Materials Center

June 2011



Prairie Sandreed

(*Calamovilfa longifolia*)

and

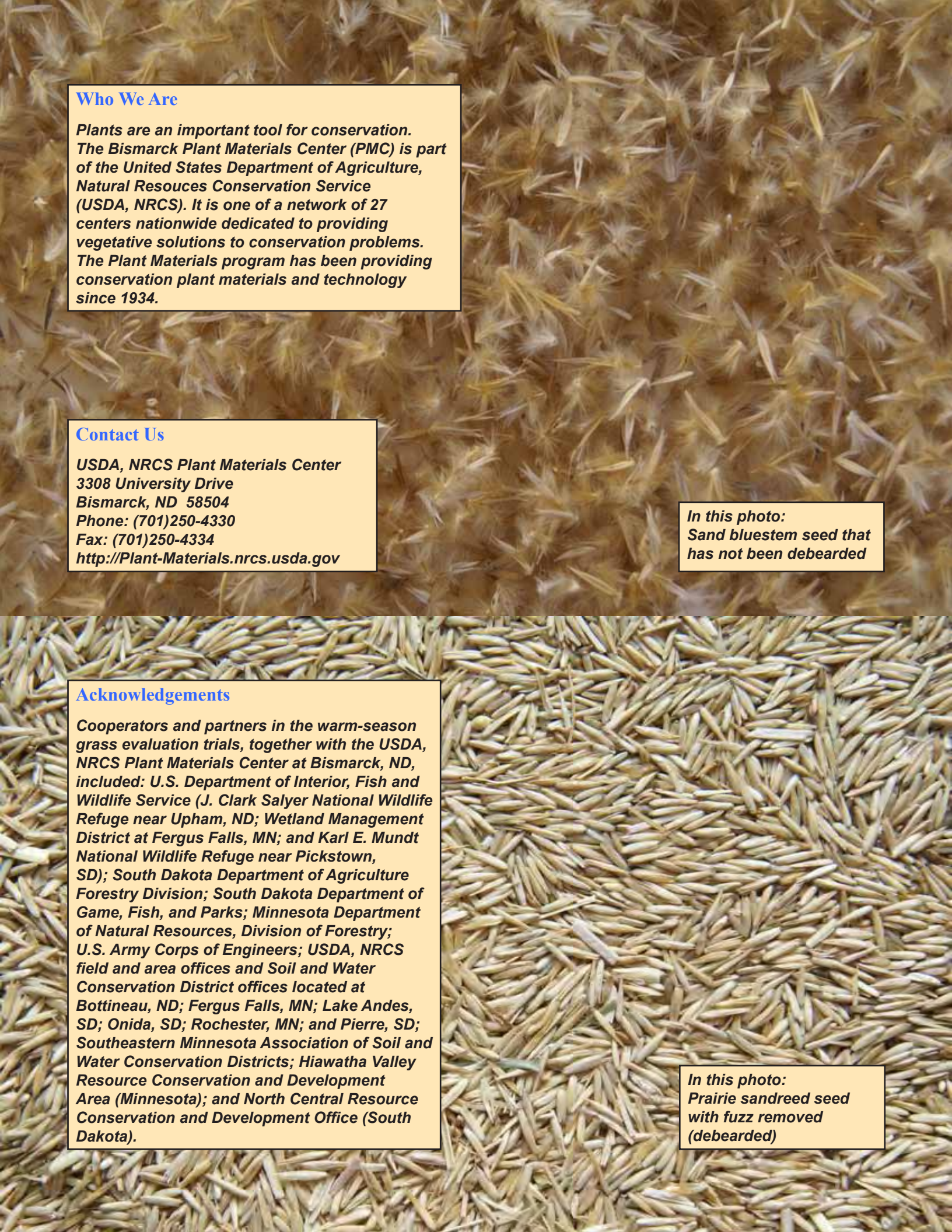
Sand Bluestem

(*Andropogon hallii*)

Performance Trials

North Dakota, South Dakota, and Minnesota



The background of the top half of the page is a close-up photograph of sand bluestem seed. The seeds are small, light brown, and have a feathery, downy appearance, typical of grass seeds before they are fully mature or processed.

Who We Are

Plants are an important tool for conservation. The Bismarck Plant Materials Center (PMC) is part of the United States Department of Agriculture, Natural Resources Conservation Service (USDA, NRCS). It is one of a network of 27 centers nationwide dedicated to providing vegetative solutions to conservation problems. The Plant Materials program has been providing conservation plant materials and technology since 1934.

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*In this photo:
Sand bluestem seed that
has not been debearded*

The background of the bottom half of the page is a close-up photograph of prairie sandreed seed. These seeds are elongated, spindle-shaped, and have a smooth, light tan or yellowish surface, appearing much more uniform and less downy than the sand bluestem seeds above.

Acknowledgements

Cooperators and partners in the warm-season grass evaluation trials, together with the USDA, NRCS Plant Materials Center at Bismarck, ND, included: U.S. Department of Interior, Fish and Wildlife Service (J. Clark Salyer National Wildlife Refuge near Upham, ND; Wetland Management District at Fergus Falls, MN; and Karl E. Mundt National Wildlife Refuge near Pickstown, SD); South Dakota Department of Agriculture Forestry Division; South Dakota Department of Game, Fish, and Parks; Minnesota Department of Natural Resources, Division of Forestry; U.S. Army Corps of Engineers; USDA, NRCS field and area offices and Soil and Water Conservation District offices located at Bottineau, ND; Fergus Falls, MN; Lake Andes, SD; Onida, SD; Rochester, MN; and Pierre, SD; Southeastern Minnesota Association of Soil and Water Conservation Districts; Hiawatha Valley Resource Conservation and Development Area (Minnesota); and North Central Resource Conservation and Development Office (South Dakota).

*In this photo:
Prairie sandreed seed
with fuzz removed
(debearded)*

Prairie Sandreed (*Calamovilfa longifolia*) **and** **Sand Bluestem** (*Andropogon hallii*) **Performance Trials** **North Dakota, South Dakota, and Minnesota**

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Performance information is important when selecting grass species and varieties for a specific location and intended use. Nine species of warm-season grasses were evaluated from 1982 to 1992 at six locations across North Dakota, South Dakota, and Minnesota. Each species included two or more varieties or seed sources. Data was collected for all species. Prairie sandreed and sand bluestem performance will be presented in this report. Information described includes biomass yield, stand index (estimate of stand density), and phenology (documents the occurrence of first ripe seed). These are all characteristics related to overall performance and are a measure of adaptation, and overall fitness of the plant to the site (Jacobson et al 1986).

Trial Sites

The grasses were studied at various locations in cooperation with numerous partners (see acknowledgements inside front cover). Trial sites were located near Upham, ND; Fergus Falls, MN; Rochester, MN; Lake Andes, SD; Onida, SD; and Fort Pierre, SD (Fig. 1). Soils and precipitation information are included with the tables (pages 8-13). Growing seasons at the six locations varied from an average of 110 days at Upham, ND, to an average of 150 days at Rochester, MN. Average annual precipitation ranged from 15 to 30 inches.



Figure 1. Locations of warm-season grass trials in North Dakota, South Dakota, and Minnesota

Methods and Materials

The experimental design was a randomized complete block with three replications for data collection. An evaluation array was seeded for demonstration purposes. Plot size varied from 12 to 15 feet in width, and from 60 to 100 feet in length. A clean, firm seedbed was prepared by disking, harrowing, and roller packing. All plots were seeded using the same grass drill. Herbicides were applied for weed control. Biomass residue was removed each spring either by mowing and raking, or burning. No fertilizer was applied.



Data collection at all six locations included stand ratings, plant height, weed contamination, stand index density, phenology, and annual biomass production. Only biomass yield, stand density, and phenology are presented and discussed in this report.

Stand index density was determined by estimating the number of plants in a 9-inch by 16-inch quadrat. Ten quadrats were systematically counted near the center line of each plot. A density index rating was developed. Values ranging from 0 to 40 units per square foot were used to estimate density for each subsample.

Dry matter yield was documented at all sites beginning the second year following establishment. Biomass production was determined by clipping a 2-foot by 10-foot subplot in each plot with a forage harvester. Sampling dates were as close as possible to the end of the growing season (first killing frost). The sample plots were systematically located within each plot across the treatment and clipped to a stubble height of approximately 2 inches. After weighing the large samples, small (100 gram) grab samples were weighed, oven-dried at 60 degrees C for 48 hours, and used for dry matter determinations. Biomass yield is reported in pounds per acre (USDA NRCS 1983-1993).



All plots were planted into a clean, firm seedbed using the same grass drill



Ten frames in each plot were sampled to determine the stand density



Plant height was recorded



Harvesting 10-foot by 2-foot strips to determine biomass yield

Sand Bluestem

Sand bluestem (*Andropogon hallii* Hack.) is a tall, perennial, warm-season grass that is closely related to big bluestem. It has more prominent rhizomes and its blue-green leaves are more gray and waxy than big bluestem. It is a tallgrass prairie plant that is typically 3-7 feet tall. The turkey foot shaped seed heads of sand bluestem have dense yellow hairs. It is not as palatable as big bluestem but can provide excellent grazing.

Sand bluestem is found growing almost exclusively on sandy soils. It is found naturally from northern Mexico into the central plains where it is an important species of sandhill prairie communities. This species mainly occurs farther west than Iowa but is also found in Illinois and Indiana. It is generally not found where annual precipitation is less than 14 inches, or greater than 30 inches.

Uses of sand bluestem include erosion control plantings on sandy, loamy sand, or sandy loamy sites. It establishes fairly readily on blowouts where its rhizomes help in stabilizing sandy soils. Generally, it is planted as a mixture with other warm-season species. Forage quality is good and it is high in palatability and crude protein before heading. Wildlife make use of the clump-like growth habit for cover, and use the seeds as a food source. Sand bluestem is becoming more popular as an accent plant in landscaping because of its distinctive blue color and golden seed heads (USDA NRCS 2011).

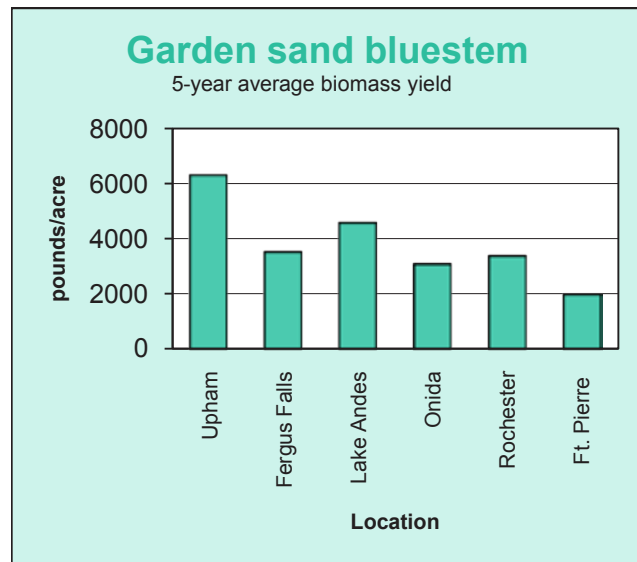


Variety/Seed Source Origins (USDA SCS 1994)

'Garden'

Garden sand bluestem originated from a composite of several individual collections of native plants from Garden County in west central Nebraska. Collections were made in 1957 by Murray Cox and R.L. Carver from the Soil Conservation Service Plant Materials Center in Scottsbluff, NE. Individual collections were increased and composited. The composite was field tested as PM-NB-378 in several parts of Nebraska and South Dakota. It was released in 1960.

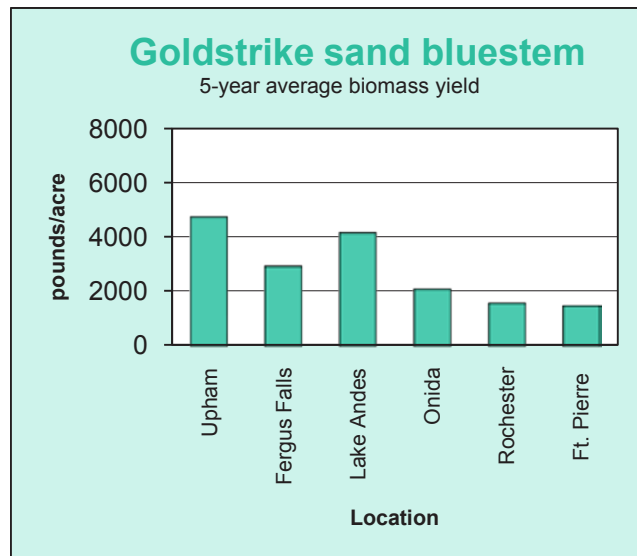
It is described as vigorous, tall, and leafy with good seed yields. Biomass yield was higher for Garden compared to Goldstrike at every location. Stand persistence was also better for Garden.



'Goldstrike'

Goldstrike sand bluestem originated from domestic collections made in 1953 from the western and northern sandhills of Nebraska and a source from western Oklahoma by L. C. Newell and W. L. Tolstead. Two lines were selected from the collections. One of the lines called Western Sandhills Yellow traces to collections in the north central Nebraska sandhills. The lines were developed independently by successive generations of mass selection for lack of rust and for color of inflorescence. The unique gold color of the inflorescence characterizes the variety.

It was released in 1973, cooperatively by Nebraska Agriculture Experiment Station and USDA, Agricultural Research Service, Lincoln, NE. Plants are variable in height and spread from short to long rhizomes. Characteristic leaf color is blue-green in early growth and changes to yellow-green at maturity.



Prairie Sandreed

Prairie sandreed (*Calamovilfa longifolia* (Hook.) Scribn.) is a tall, perennial, warm-season grass. Plant growth above ground begins in mid-May, which is earlier than most perennial warm-season grass species. The extensive, scaly, sharp pointed rhizomes and coarse, fibrous roots are important erosion control attributes. The plants are typically 2-5 feet tall. The leaves are flat to rolled, smooth, $\frac{1}{8}$ to $\frac{1}{2}$ inch wide and tapering to a long, fine point. The light green foliage becomes straw colored as it matures. The seed head is a panicle that is usually contracted except when flowering. Flowering dates range from July through August and seed set is in September. The plant is coarse and tough, but produces considerable biomass that is of fair quality for cattle, horses, and sheep during its initial growth and after it cures on the stem for fall and winter grazing. New plantings establish slowly. Prairie sandreed is susceptible to stem and leaf rust in higher rainfall areas.

Prairie sandreed occurs primarily on coarse or sandy soil sites in typically low precipitation (10-20 inches) zones. Occasionally it is found on clay soils or loess. Prairie sandreed is not tolerant to salt, spring flooding or high water tables, but will grow on soils that are somewhat alkaline. It commonly grows in clumps or colonies in mixed native stands of sand bluestem, little bluestem, sand lovegrass, and yucca. It is native to the United States and is found growing from Michigan and Ontario to Alberta, south to Illinois, Iowa, Kansas, Colorado, and Idaho (Barkworth et al 2007).

Erosion control and wildlife habitat on sandy sites are primary uses for prairie sandreed. The extensive fibrous root system and rhizomatous growth habit make it an excellent species for stabilizing sandy sites. It also provides a food source for grazing and browsing wildlife in early spring and summer. The tall upright growth habit allows for accessible forage in the winter. Prairie sandreed plant communities tend to be very site specific patches that provide valuable cover for wildlife in areas that are often void of taller vegetation. Seed is used by birds and rodents (USDA NRCS 2011).

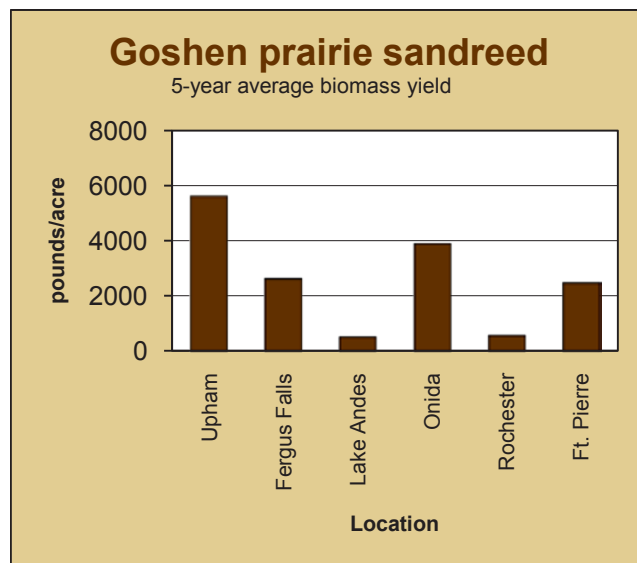


Variety/Seed Source Origins (USDA SCS 1994)

'Goshen'

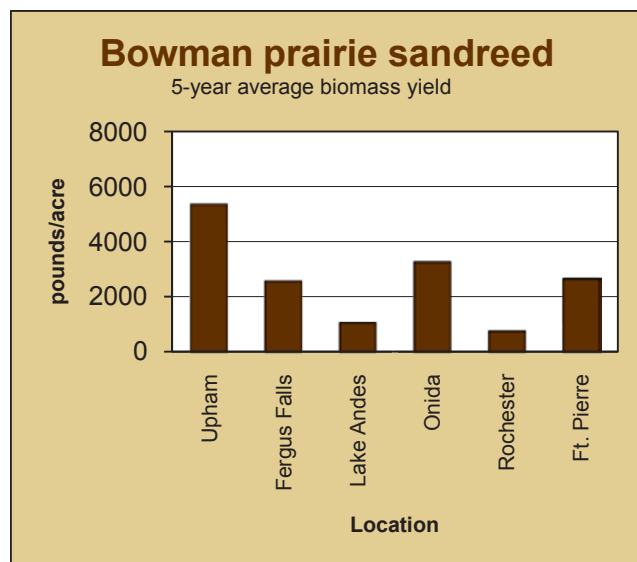
Goshen originated from seed harvested, in 1959, near Torrington in southeast Wyoming. The field collection was increased without selection. The collection was evaluated as WY-17 and P-15588. The variety was cooperatively named and released by the Soil Conservation Service and the Montana and Wyoming Agricultural Experiment Stations in 1976.

Performance of Goshen and Bowman, including biomass yield, was very similar at each of the six locations.



Bowman (ND-95)

Bowman originated from seed that was collected in the fall of 1956 from a field in southwestern North Dakota (Bowman County). The collection was evaluated as accession PI-477995 (ND-95). Plants grown from the Bowman County seed were compared at the Bismarck, ND, NRCS Plant Materials Center with other field collections. ND-95 was not formally released because of similar performance to Goshen. Performance of ND-95 was better than Goshen in Manitoba and Saskatchewan, Canada. The selection was informally released as Bowman.



PI-477007

This accession originated from a native seed collection in Mason County, located in central Michigan. It is one of four parent lines that comprise Koch Germplasm, a select class release from the Rose Lake, MI, NRCS Plant Materials Center and Michigan Association of Conservation Districts. PI-477007 was tested only at the Rochester location where the 5-year biomass yield was 1221 lb/ac compared to 596 for Goshen, and 787 for Bowman.

Upham, ND Trial Location

The soils are a very productive Great Bend silty clay loam. Average annual precipitation for the five years of biomass harvest was near normal.

Garden sand bluestem biomass yield was higher than Goldstrike every year except 1984. Its 5-year average yield was more than 6,000 lb/ac. Both varieties had good stands with stand index densities of 28. The varieties originated in Nebraska and were later maturing. Phenology was the same, with both varieties being at 50 percent seed ripe in early August.

Stands of prairie sandreed were slower to establish and maintained a more open cover. Bowman had a slightly higher stand index than Goshen, 12 compared to 10. Biomass yields were not significantly different between Bowman and Goshen, except in 1985. The 5-year average yield for each entry was over 5,000 lb/ac. Phenology was the same with both varieties being at 50 percent seed ripe in early August.



Upham, ND (MLRA 55A, north central North Dakota)

Average Annual Precipitation: 16.08 inches

Soils: Great Bend silty clay loam

Variety	Sand Bluestem							Stand	Phenology ³
	Biomass ¹ (lb/ac)							Index ²	
(inches)	1983	1984	1985	1986	1987	Avg	Rank	1982-1984*	Early August
Precip. deviation	(0.98)	(0.9)	(1.63)	(-0.09)	(-1.23)				
Garden	7855a	3705b	7266a	6694a	5993a	6303	1	28	5
Goldstrike	6324a	5972a	3357b	4338b	3667a	4732	2	28	5

Variety	Prairie Sandreed							Stand	Phenology ³
	Biomass ¹ (lb/ac)							Index ²	
(inches)	1983	1984	1985	1986	1987	Avg	Rank	1982-1984*	Early August
Precip. deviation	(0.98)	(0.9)	(1.63)	(-0.09)	(-1.23)				
Bowman	3437a	3339a	8352a	7276a	4389a	5359	2	12	7
Goshen	3626a	4522a	7285b	7295a	5372a	5620	1	10	7

Statistical Analyses: Duncan's New Multiple Range Test, means with same letter are not significantly different ($P \leq .05$)

¹**Biomass:** flail-type forage harvester, 2' x 10' strip in each plot clipped to a 2-inch stubble height

²**Stand Index:** Estimate of plant density in 10 (1.0 sq ft) quadrats per plot. Full frame=40

³**Phenology (1984):** 1=vegetative; 2=jointing; 3=first emergence of inflorescence; 4=first anthesis, 10 culms or more; 5=50% anthesis; 6=first seed ripe; 7=50% seed ripe; 8=seed mature; 9=complete dormancy

* Data is an average from these years

Fergus Falls, MN Trial Location

The soils on this site are a well drained loam complex in calcareous glacial till. Precipitation was well below normal in 1983 (-3.9) and 1987 (-7.2), and more than 6 inches above normal in 1986.

There were no significant differences in biomass yield in any year, but Garden yields were higher than Goldstrike every year except 1984. Garden averaged 3,529 lb/ac, and Goldstrike averaged 2,924 lb/ac for five years. Plant densities were good for both varieties. Each had a stand index of greater than 20. Phenology in early September was at 50 percent anthesis for both varieties.

Prairie sandreed again had a more open stand. Each variety had an index density of only 6, and the same phenology at 50 percent anthesis. Biomass yields were similar at approximately 2,500 lb/ac for the 5-year average. Annual biomass yields for both sand bluestem and prairie sandreed were closely aligned with the highs and lows in annual precipitation.



Fergus Falls, MN (MLRA 102A, west central Minnesota)

Average Annual Precipitation: 23.52 inches

Soils: Barnes and Langhei loam

Variety	Sand Bluestem							Stand	Phenology ³
	Biomass ¹ (lb/ac)							Index ²	
(inches)	1983	1984	1985	1986	1987	Avg	Rank	1983-1984	Early Sept.
Precip. deviation	(-3.96)	(1.54)	(.85)	(6.23)	(-7.2)				
Garden	3076a	3672a	3832a	4454a	2609a	3529	1	24	5
Goldstrike	2673a	5247a	2780a	2594a	1325a	2924	2	24	5

Variety	Prairie Sandreed							Stand	Phenology ³
	Biomass ¹ (lb/ac)							Index ²	
(inches)	1983	1984	1985	1986	1987	Avg	Rank	1983-1984	Early Sept.
Precip. deviation	(-3.96)	(1.54)	(.85)	(6.23)	(-7.2)				
Bowman	2446a	3786a	2169a	3357a	1203a	2592	2	6	5
Goshen	1635a	3376a	3221a	3141a	1836a	2642	1	6	5

Statistical Analyses: Duncan's New Multiple Range Test, means with same letter are not significantly different ($P \leq .05$)

¹**Biomass:** flail-type forage harvester, 2' x 10' strip in each plot clipped to a 2-inch stubble height

²**Stand Index:** Estimate of plant density in 10 (1.0 sq ft) quadrats per plot. Full frame=40

³**Phenology (1983):** 1=vegetative; 2=jointing; 3=first emergence of inflorescence; 4=first anthesis, 10 culms or more; 5=50% anthesis; 6=first seed ripe; 7=50% seed ripe; 8=seed mature; 9=complete dormancy

* Data is an average from these years

Lake Andes, SD Trial Location

The soils are a fertile Agar silt loam. Biomass yields were influenced by three years of “well above average” precipitation. Precipitation was 12.9 inches (1984), 10.7 (1986), and 3.71 (1987) above the average. This was the southernmost evaluation location.

Sand bluestem biomass yield for each variety was more than 7,000 lb/ac in 1986. Garden yields were slightly higher every year, but there was no significant differences. Five-year average biomass yields were each over 4,000 lb/ac. Stand indexes were similar at 15 for Garden, and 16 for Goldstrike. Phenology was the same for both varieties at 50 percent anthesis in early September.

Bowman prairie sandreed (18) had more than three times the stand index density of Goshen (5). It also was earlier maturing and was at 50 percent ripe seed in early September compared to Goshen at 50 percent anthesis. Bowman was higher than Goshen in 5-year average biomass yield, with 1,080 lb/ac compared to 713 lb/ac. Stem and leaf rust were heavy on both varieties and reduced stands and persistence.



Lake Andes, SD (MLRA 55C, southeast South Dakota)

Average Annual Precipitation: 21.37 inches

Soils: Agar silt loam

Variety	Sand Bluestem							Stand	Phenology ³
	Biomass ¹ (lb/ac)							Index ²	
(inches)	1984	1985	1986	1987	1988	Avg	Rank	1984	Early Aug.
Precip. deviation	(12.9)	(-.21)	(10.7)	(3.71)	(1.0)				
Garden	3073a	4134a	7433a	3927a	4321a	4578	1	15	5
Goldstrike	2702a	3996a	7219a	2947a	3865a	4146	2	16	5

Variety	Prairie Sandreed							Stand	Phenology ³
	Biomass ¹ (lb/ac)							Index ²	
(inches)	1984	1985	1986	1987	1988	Avg	Rank	1984	Early Aug.
Precip. deviation	(12.9)	(-.21)	(10.7)	(3.71)	(1.0)				
Bowman	2000a	179a	1653a	488b	no sample	1080	1	18	7
Goshen	446b	0	959a	734a	no sample	713	2	5	5

Statistical Analyses: Duncan's New Multiple Range Test, means with same letter are not significantly different ($P \leq .05$)

¹**Biomass:** flail-type forage harvester, 2' x 10' strip in each plot clipped to a 2-inch stubble height

²**Stand Index:** Estimate of plant density in 10 (1.0 sq ft) quadrats per plot. Full frame=40

³**Phenology (1984):** 1=vegetative; 2=jointing; 3=first emergence of inflorescence; 4=first anthesis, 10 culms or more; 5=50% anthesis; 6=first seed ripe; 7=50% seed ripe; 8=seed mature; 9=complete dormancy

Onida, SD Trial Location

The soils at the site are a Lowry silt loam, which is fertile but droughty. Average annual precipitation was considerably above normal in 1988 (-4.07 inches).

Garden was higher in biomass yield every year, and produced almost 7,000 lb/ac in 1986. Five-year average forage yields were 3,081 lb/ac for Garden, and 2,095 lb/ac for Goldstrike. Stand index densities were high for both varieties at 28 for Garden, and 32 for Goldstrike. Maturity was similar in early September at first or 50 percent seed ripe.

Goshen was higher in biomass forage yield every year except 1986. Each variety produced more than 7,500 lb/ac in 1986. Five-year average biomass yields were 3,282 for Bowman, and 3,900 for Goshen. Average stand index densities were similar in early September at 50 percent anthesis, or first seed ripe.



Onida, SD (MLRA 53C, central South Dakota)

Average Annual Precipitation: 17.47 inches

Soils: Lowry silt loam

Variety	Sand Bluestem Biomass ¹ (lb/ac)							Stand Index ²	Phenology ³
	1985	1986	1987	1988	1989	Avg	Rank	1984-1985*	Early Sept.
(inches)									
Precip. deviation	(.13)	(5.27)	(-1.86)	(-4.07)	(.33)				
Garden	1567a	6861a	3832a	1290a	1853a	3081	1	28	6
Goldstrike	1132a	5332a	2435a	910a	668a	2095	2	32	7

Variety	Prairie Sandreed Biomass ¹ (lb/ac)							Stand Index ²	Phenology ³
	1985	1986	1987	1988	1989	Avg	Rank	1984-1985*	Early Sept.
(inches)									
Precip. deviation	(.13)	(5.27)	(-1.86)	(-4.07)	(.33)				
Bowman	1181a	7791a	3499a	1649a	2292a	3282	2	15	6
Goshen	1529a	7578a	4446a	2196a	3751a	3900	1	12	5

Statistical Analyses: Duncan's New Multiple Range Test, means with same letter are not significantly different ($P \leq .05$)

¹**Biomass:** flail-type forage harvester, 2' x 10' strip in each plot clipped to a 2-inch stubble height

²**Stand Index:** Estimate of plant density in 10 (1.0 sq ft) quadrats per plot. Full frame=40

³**Phenology (1986):** 1=vegetative; 2=jointing; 3=first emergence of inflorescence; 4=first anthesis, 10 culms or more; 5=50% anthesis; 6=first seed ripe; 7=50% seed ripe; 8=seed mature; 9=complete dormancy

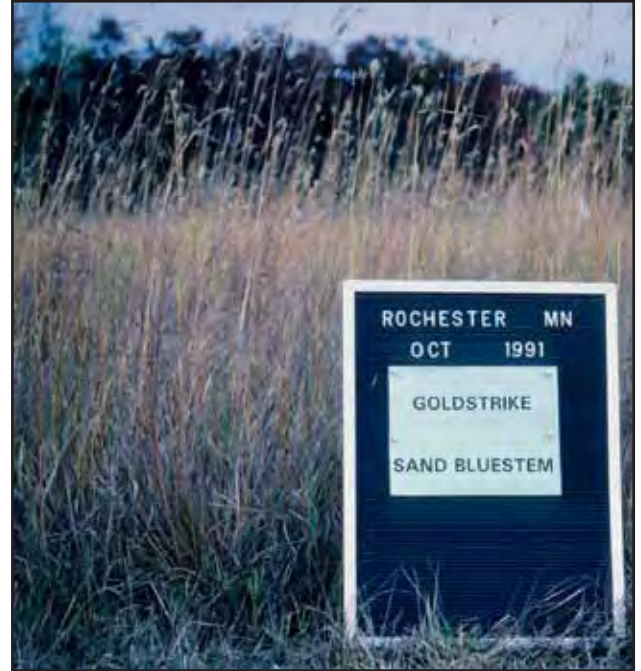
* Data is an average from these years

Rochester, MN Trial Location

The soils are a well drained, rolling silt loam. This location had the highest average annual precipitation, 29.58 inches, of the six evaluation sites. Precipitation was quite variable. It was below normal in 1987 (-2.63), 1988 (-8.19), and 1989 (-6.85). Precipitation was substantially above normal in 1990 (14.36) and 1991 (7.33).

Stand index densities were both 23 for the sand bluestem varieties. Garden was higher than Goldstrike every year in biomass yield and more than twice as high for the 5-year average. Phenology was the same at first seed ripe in early September.

The more eastern source of prairie sandreed (PI-477007) had the best biomass yield every year. Five-year biomass yield averaged 1,221 lb/ac, compared to 787 lb/ac for Bowman, and 596 lb/ac for Goshen. Stand index densities were similar at 6 and 7. Bowman was the most mature in early September with ripe seed, compared to the other two varieties with 50 percent ripe seed.



Rochester, MN (MLRA 105, southeast Minnesota)

Average Annual Precipitation: 29.58 inches

Soils: Mount Carrol silt loam

Variety	Sand Bluestem							Stand	Phenology ³
	Biomass ¹ (lb/ac)							Index ²	
(inches)	1987	1988	1989	1990	1991	Avg	Rank	1985-1987*	Early Sept.
Precip. deviation	(-2.63)	(-8.19)	(-6.85)	(14.36)	(7.33)				
Garden	4820a	2296a	2903a	3561a	3314a	3379	1	23	6
Goldstrike	3419a	979a	807b	1796a	930b	1586	2	23	6

Variety	Prairie Sandreed							Stand	Phenology ³
	Biomass ¹ (lb/ac)							Index ²	
(inches)	1987	1988	1989	1990	1991	Avg	Rank	1985-1987*	Early Sept.
Precip. deviation	(-2.63)	(-8.19)	(-6.85)	(14.36)	(7.33)				
Bowman	555a	767a	677a	1482a	456a	787	2	6	8
Goshen	773a	560a	742a	735a	168a	596	3	6	7
PI-477007	1175a	1122a	1404a	1554a	849a	1221	1	7	7

Statistical Analyses: Duncan's New Multiple Range Test, means with same letter are not significantly different ($P \leq .05$)

¹**Biomass:** flail-type forage harvester, 2' x 10' strip in each plot clipped to a 2-inch stubble height

²**Stand Index:** Estimate of plant density in 10 (1.0 sq ft) quadrats per plot. Full frame=40

³**Phenology (1988,1989):** 1=vegetative; 2=jointing; 3=first emergence of inflorescence; 4=first anthesis, 10 culms or more; 5=50% anthesis; 6=first seed ripe; 7=50% seed ripe; 8=seed mature; 9=complete dormancy

* Data is an average from these years

Fort Pierre, SD Trial Location

The soils at this site are fertile clay with low permeability. Infiltration is less than 0.2 inch/hour. Three consecutive years (1988, 1989, and 1990) of significantly lower than normal rainfall greatly reduced the annual and 5-year average biomass yields. Both species performed better than expected on this site.

Garden produced more biomass yield than Goldstrike every year except 1988. Five-year average biomass yields were 1,933 lb/ac for Garden, and 1,497 lb/ac for Goldstrike. Average stand index densities were high at 27 for Goldstrike, and 20 for Garden. Phenology was the same at 50 percent anthesis in early September.

Each prairie sandreed variety produced 5-year average biomass yields of approximately 2,500 lb/ac which was good given the low rainfall and clay soils. Average stand index densities were less than 5. Phenology was the same at 50 percent anthesis in early September. Prairie sandreed had biomass yields comparable to some of the other tallgrass species. The site was inspected in 2010 and good stands of prairie sandreed still persisted.



Fort Pierre, SD (MLRA 63A, central South Dakota)

Average Annual Precipitation: 18.08 inches

Soils: Promise clay

Variety	Sand Bluestem							Stand	Phenology ³
	Biomass ¹ (lb/ac)							Index ²	
(inches)	1988	1989	1990	1991	1992	Avg	Rank	1986-1987*	Early Sept.
Precip. deviation	(-7.3)	(-4.77)	(-5.74)	(.87)	(.79)				
Garden	249a	191a	1524a	3044a	4955a	1993	1	20	5
Goldstrike	402a	136a	941a	2310a	3694b	1497	2	27	5

Variety	Prairie Sandreed							Stand	Phenology ³
	Biomass ¹ (lb/ac)							Index ²	
(inches)	1988	1989	1990	1991	1992	Avg	Rank	1986-1987*	Early Sept.
Precip. deviation	(-7.3)	(-4.77)	(-5.74)	(.87)	(.79)				
Bowman	1256a	1796a	3714a	3320a	3212a	2660	1	4	5
Goshen	844a	1006a	3166a	3508a	3927a	2490	2	2	5

Statistical Analyses: Duncan's New Multiple Range Test, means with same letter are not significantly different ($P \leq .05$)

¹**Biomass:** flail-type forage harvester, 2' x 10' strip in each plot clipped to a 2-inch stubble height

²**Stand Index:** Estimate of plant density in 10 (1.0 sq ft) quadrats per plot. Full frame=40

³**Phenology (1990):** 1=vegetative; 2=jointing; 3=first emergence of inflorescence; 4=first anthesis, 10 culms or more; 5=50% anthesis; 6=first seed ripe; 7=50% seed ripe; 8=seed mature; 9=complete dormancy

* Data is an average from these years

Results and Discussion

Sand bluestem and prairie sandreed are special use grass species. They are native, warm-season tallgrass species that are planted primarily on sandy sites with a mixture of other species for various conservation purposes.

Garden and Goldstrike sand bluestem originate from Nebraska. These are the northernmost sources of sand bluestem available commercially. Both varieties performed fairly well in Minnesota, North Dakota, and South Dakota with good establishment and stand density indexes. Garden generally had higher biomass yields and was more persistent. On some sites, it produced more than 7,500 lb/ac of annual biomass. Both varieties (Nebraska origins) were late maturing and would unlikely produce ripe seed at the more northern locations. Winter hardiness does not seem to be a problem as there were no signs of winter injury.

The Bismarck Plant Materials Center is developing a more northern release of sand bluestem. A collection of native plants has been assembled in a spaced-plant nursery and evaluated. A composite selection from 10 sources within the three-state area was developed in 2010. Plans are for a release in the next five years.

Performance of the Goshen and Bowman prairie sandreed were comparable. There appeared to be little difference between the two varieties. Annual biomass yields were over 8,000 lb/ac on some sites. Index densities are lower than many other species because of the rhizomatous habit and the more open sod. Goshen has a more southern origin, and is slightly later in maturity. Bowman has performed better than Goshen in trials in Manitoba and Saskatchewan. Prairie sandreed performed surprisingly well on the clay site at the Fort Pierre location. The species is somewhat slower to establish than other warm-season species, and has problems with stem and leaf rust in higher rainfall regions (Sedivec 2001).



Variety Recommendations for North Dakota, South Dakota, and Minnesota

Variety/Species	Origin	Average Number of Days to Ripe Seed after July 15	Where Adapted
Garden sand bluestem	west central Nebraska	95	ND, SD, MN
Goldstrike sand bluestem	synthetic, Nebraska, Oklahoma	100	SD, southern MN
Bowman prairie sandreed	southwest North Dakota	90	ND, SD
Goshen prairie sandreed	southeast Wyoming	95	ND, SD
Koch prairie sandreed	PI-477007 from central Michigan	105	MN

Key Establishment and Management Considerations

- **Soils/Adaptation:** Sand bluestem and prairie sandreed occur naturally on sandy soils. Performance testing has shown that they can perform well on a diversity of sites, especially under droughty conditions. Prairie sandreed is also found on shale sites, and performed well on a clay site.
- **Seeding:** Sand bluestem has approximately 113,000 seeds/lb, and prairie sandreed has approximately 275,000 seeds/lb. Sand bluestem has dense yellow hairs on the seed head, and prairie sandreed has a ring of silky white hairs at the base of each seed. Seed of both species will flow better in a drill if debearded. Seed that is not debearded will have to be planted through the chaffy seed box of a grass drill. Seeding rates generally increase with higher precipitation from west to east. The NRCS recommended rates for western North Dakota are 9.5 Pure Live Seed (PLS) lb/ac for sand bluestem (25 seeds/ft²), and 4 PLS lb/ac for prairie sandreed (25 seeds/ft²). Broadcast seeding rates are generally higher than recommended drilled seeding rates. Late spring seeding is recommended. A firm seedbed is essential for a shallow seeding depth (1/4-1/2 inch). Seed may be planted slightly deeper in sandy soil (USDA NRCS 2003).
- **Weed Control:** Abundant broadleaf weeds and annual grasses need to be controlled in new seedings by mowing and/or herbicide application. Mowing is generally less effective in controlling annual grasses.
- **Fertilization:** Biomass yield, quality and seed production can be improved with fertilization if nitrogen or other nutrients are limiting. A soil test is recommended.
- **Grazing/Haying/Mowing:** Sand bluestem will provide good grazing from early summer to early fall. With proper grazing management, sand bluestem can withstand substantial grazing, but close grazing can decrease the stand. A stubble height of 6 inches is recommended to ensure stand longevity. Sand bluestem should be established in a native plant mixture. The establishment of sand bluestem would not be recommended for use as hayland in a forage system. Prairie sandreed has low palatability during the growing season and therefore is not a preferred pasture species. However, once exposed to a killing frost, lignin is reduced and palatability improves. Close grazing will decrease the plant populations. A stubble height of 4 inches is recommended to maintain a stand. Prairie sandreed should be planted with a native plant mixture. The use of prairie sandreed in a hayland forage system is not recommended (USDA 2009).
- **Burning:** Both species will benefit from burning of plant residue prior to initiation of spring growth, especially for seed production. Benefits include low impact residue removal, weed control, more uniform growth initiation and seed ripening, improved nutrient cycling, and improved vigor. Seed producers generally burn residue annually to increase yields.
- **Seed Harvest:** Seed shattering may occur shortly after first seed ripe for both species. Sand bluestem is ready to harvest earlier than prairie sandreed, but harvest dates depend on the days to maturity of the variety being grown. Sand bluestem threshes fairly easily, and settings are similar to big bluestem. Conventional combines can be used with proper setting adjustments, screen sizes, and reduced air flow. The awns or fuzz on the seed may cause problems with seed flowing through the combine. Prairie sandreed is usually harvested as late in the season as possible before seed shattering. This allows it to dry down and be combined directly without swathing. Stems and leaves are high in lignin and tend to wrap on harvesting equipment. The light, fuzzy seed adheres to any sticky surface. After harvest, seed of both species is subject to heating, and moisture levels may require drying. Air drying is recommended as excessive heat may damage the seed. Fields should be as weed-free as possible prior to harvest to aid in the seed cleaning process.



Prairie sandreed varieties differ in size and phenology



A prescribed burn is an important management tool

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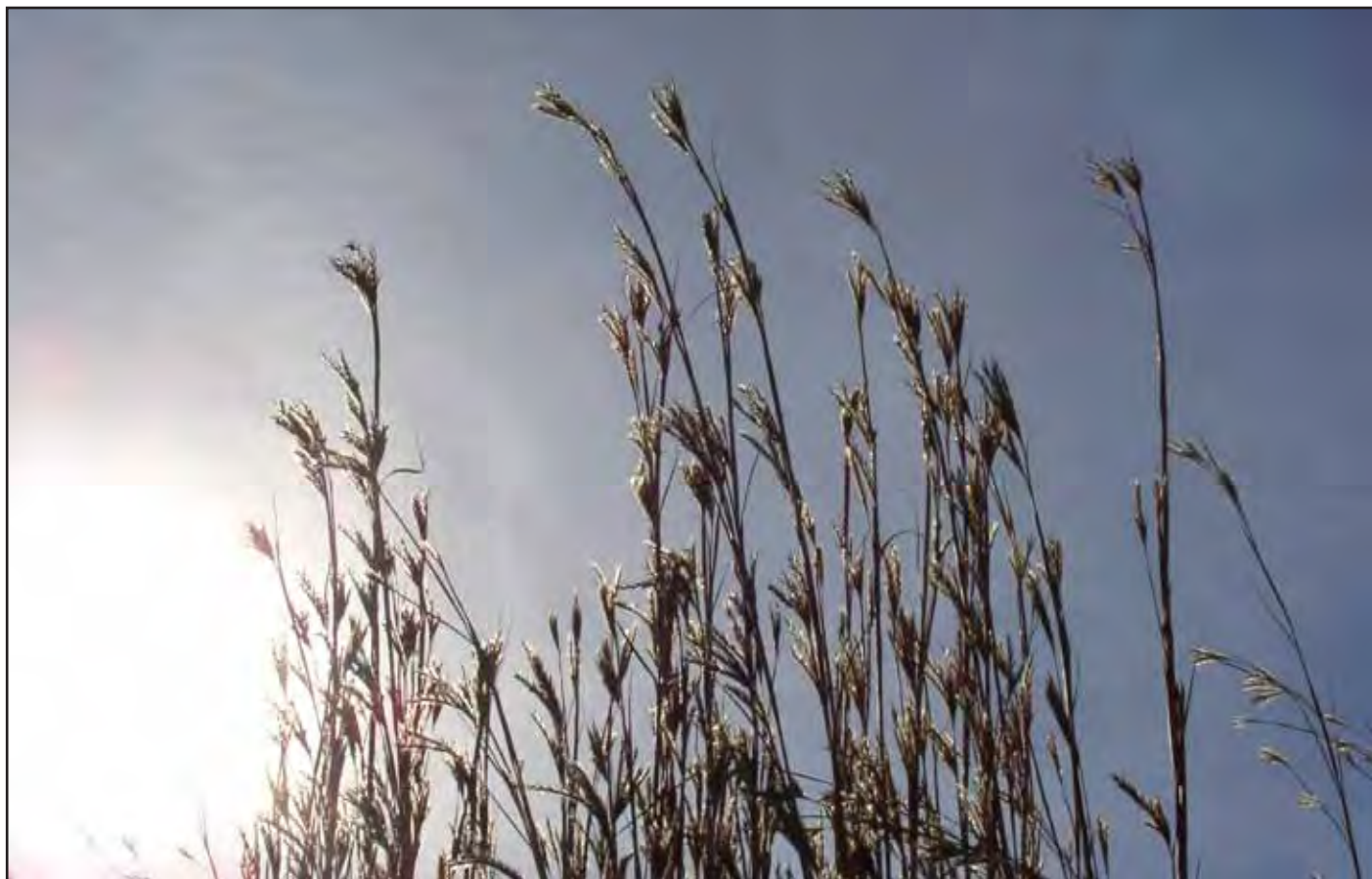
***Prairie sandreed seed head
opens as it matures***



Leaf rust on prairie sandreed



***Sand bluestem seed head
has dense, yellow hairs***



Sand bluestem

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