Warm-Season Grasses in the Northern Great Plains

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The early morning dew has disappeared with the rising sun and a breeze stirs the ripe harvest awaiting the farmer's approach. The crop is not wheat or grain sorghum, but the reddish tinted, golden seed crop of big bluestem. The header on the combine is raised high to reach toward the seed of the tall perennial crop. This crop won't have to be reseeded next year, or for many years. Big bluestem is a native perennial warm-season grass that stands shoulder high to a horse in the tall-grass prairie region where it was once a dominant species. If seed harvest isn't planned next year, the high quality forage can be grazed during the hot summer months after cool-season species go dormant.

In an area where seasonal low temperatures may fall below -30 degrees F, and gardeners wait until late May or early June to move plants outdoors for the summer, cool-season grasses may seem more appropriate. Yet, there is increased interest in utilizing warm-season grasses in the Northern Great Plains. The availability of adapted varieties and increased seed supplies of native warm-season grasses for this region are adding a new dimension to natural resource management.

Rangelands in the Northern Great Plains are generally perceived as predominantly cool-season grasslands. Although cool-season species are dominant on some range sites, others, such as the sands, sandy loam, and shallow sites originally supported a high percentage of warm-season grasses. Even the "cool-season sites" supported some warm-season species in the presettlement or climax plant community. In many instances, plant communities have changed toward cool-season dominance, due to season or frequency of grazing. Deferred rotation and short duration grazing systems have been used, along with proper stocking rates, to rejuvenate many sites to mixtures of cool- and warm-season species, more representative of the climax plant community.

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Native warm-season grasses were major components of many climax plant communities of the Northern Great Plains. (Photo by D. Chamrad)

The native warm-season grasses have unique characteristics that enhance their value as pasture and hayland plantings, as components of range and wildlife seedings, and for other conservation purposes. They provide excellent summer forage and high quality hay. They also are effective for erosion control and soil improvement, and they provide excellent wildlife habitat. Some of the warm-season species are tolerant of agricultural chemicals, while most are fire tolerant and respond favorably to periodic burning. The warm-season native grasses are long-lived and economical to maintain.

Big bluestem is considered an "ice-cream" plant which is highly palatable and nutritious. Switchgrass, with its small, smooth seed, is easy to plant and produces high biomass, 2-4 tons/acre dry matter, suitable for grazing or haying. Indiangrass is also highly nutritious and desirable for adding diversity in wildlife habitat. Sideoats grama, a palatable midgrass, has excellent seedling vigor, is drought hardy, and cures well. Sand bluestem and prairie sandreed are well adapted to sandy soils and provide excellent soil stabilization. Little bluestem is especially well adapted to limy soils of both wet and dry sites where it is often the dominant species. Blue grama is adapted to a wide range of soils and is a component of most upland range sites in the northern plains region. Many of the native warm-season grasses are seasonally colorful and contribute to attractive landscapes throughout the region.

Warm-season grasses are being evaluated by the SCS Bismarck Plant Materials Center at the J. Clark Salyer National Wildlife Refuge near Upham, North Dakota. (Photo by E. Jacobson)

Warm-season grasses have long been recognized as important range and pasture forage in the southern and central plains states but previously have been used only to a limited extent in the northern plains. Warm-season grass varieties originating from Nebraska and Kansas have been planted in the northern region but generally with unsatisfactory results. Winter injury and poor plant performance are often the result of moving native warm-season grasses too far north of their origin.

Consequently, revegetation activity in the Northern Great Plains has relied heavily on smooth bromegrass, crested wheatgrass, intermediate and pubescent wheatgrass, tall wheatgrass, and other introduced cool-season species. The cool-season species were also favored due to ease of establishment, readily available seed supply, low seed costs, and good quality forage in early spring and late fall. Most of the approximately 9.5 million acres seeded in the Conservation Reserve Program (CRP) in South Dakota, Minnesota, North Dakota, and Montana were seeded to introduced cool-season grasses. When CRP contracts begin to expire in 1996, producers desiring to graze their CRP lands will be looking for adapted warm-season species to complement those predominantly cool-season forages.

Warm-season grasses are no longer considered "hard to establish". Improved seeding equipment, better establishment techniques, new chemicals, and improved seedling vigor of new varieties have greatly improved success. Most planting failures occur because of poor seedbed preparation, planting the seed too deep, inadequate weed control, and the use of unadapted varieties.

The Soil Conservation Service (SCS), Plant Materials Center (PMC) at Bismarck, North Dakota, assembles, evaluates, and releases improved varieties of grasses, trees, and shrubs for resource conservation purposes

'Forestburg' switchgrass pasture on Myron Hoeckle farm near Pingree, North Dakota. (Photo by R. Haas)

in North Dakota, South Dakota, and Minnesota. The grass improvement program centers around development of cultivars of native grasses and closely related introduced species for this region. Variety releases are made in cooperation with USDA, Agricultural Research Service, and state agricultural experiment stations.

The Bismarck PMC, with the guidance of Erling Jacobson, SCS Regional Plant Materials Specialist, Lincoln, Nebraska, has established a series of long-term, replicated field evaluation plantings of more than 35 entries of seven species of warm-season grasses. Evaluations have included stand establishment, seedling vigor, phenology, disease and insect resistance, forage production, winter hardiness, and drought tolerance. Six evaluation plantings have been established since 1982 in the three-state area. Plant performance data have been collected for a six-year period at each location. Included at all locations were the major varieties and advanced selections of big bluestem, Indiangrass, switchgrass, sand bluestem, prairie sandreed, little bluestem, and sideoats grama. The effect of seed origin on growth and stand density was very evident. Winter injury occurred on many varieties from the central and southern plains. Phenological differences varied among species and among sites. Overall performance was strongly influenced by plant origin. According to Russ Haas, SCS Plant Materials Specialist, Bismarck, North Dakota, seedling vigor, winter hardiness, drought tolerance, longevity and resiliency, are characteristics especially important in cultivars for the Northern Great Plains. Since 1983, six new varieties of three species (big bluestem, Indiangrass, and switchgrass) have been released by cooperating state and federal agencies for conservation use in the northern plains region (Table 1).

Research results support the value of the improved warm-season varieties for livestock production. According to Paul Nyren, Superintendent /Range Scientist, North Dakota State University, Central Grasslands Research Center, near Streeter, North Dakota, animal performance on 'Dacotah' switchgrass has been exceptional over a three-year evaluation period. In 1991, calves had an average daily gain of 2.54 lb/head during a 26-day grazing period from mid June to mid July. During the same period, cows were also gaining weight at the rate of 1.5 lb/head/day.

Table 1. Adapted varieties of native warm-season grasses recommended for use in the Northern Great Plains.

Species	Variety (Released)	Origin
big bluestem *(Andropogon gerardii)*	**Bison** (1989) **Bonilla** (1987)	Central ND East central SD
Indiangrass *(Sorghastrum nutans)*	**Tomahawk** (1988)	Southeast ND and Northeast SD
switchgrass *(Panicum virgatum)*	**Dacotah** (1989) **Forestburg** (1987) **Sunburst** (1983)	Central ND East central SD Southeast SD
prairie sandreed *(Calamovilfa longifolia)*	**Goshen** (1976)	Southeast WY[1]
sand bluestem *(Andropogon hallii)*	**Garden** (1960) **Goldstrike** (1973)	Western NE[1] Western NE[1]
little bluestem *Schizachyrium scoparium)*	(none available)	
blue grama (Bouteloua gracilis)	(none available)	
sideoats grama *(Bouteloua curtipendula)*	**Killdeer** (1963) **Pierre** (1961)	Western ND Central SD

[1]Northern origin varieties still needed.

Warm-season grasses are important components of seeding mixtures for wildlife habitat development in the Northern Great Plains. (Photo by M. Knudson)

Many producers actually have "too much" cool-season forage for good seasonal balance and could benefit greatly from the high quality forage that warm-season grasses produce in July and August. North Dakota rancher, Jerome Kitzmann, is integrating native warm-season range grasses into his 12-pasture high intensity grazing system near Center, North Dakota. Cool-season smooth bromegrass previously represented 75 to 80 percent of his forage base. Kitzmann had an overabundance of high quality forage in early spring and fall but lacked seasonal balance during the summer months. Warm-season mixtures of 'Killdeer' sideoats grama, 'Dacotah' switchgrass, 'Forestburg' switchgrass, and 'Bison' big bluestem were seeded in 1989. Range seeding mixtures of both warm- and cool-season species, including 'Rosana' western wheatgrass, 'Lodorm' and SD-93 green needlegrass, 'Pierre' sideoats grama, 'Goshen' prairie sandreed, and native harvest blue grama, have also been utilized in his grazing management program.

Wildlife managers also are looking more closely at the advantages provided by warm-season native grasses for wildlife habitat. Brent Wark, Manitoba Provincial Habitat Biologist for Ducks Unlimited Canada,

Winnipeg, Canada, says, "Warm-season grasses are an important component of the native mixtures being planted in southern Manitoba. We try to be relatively site specific and put the warm-season grasses back where they were found naturally." During the last 10 years, according to Wark, Manitoba has been a "testing ground" in Canada for establishment techniques and variety/species trials of native grasses for wildlife plantings. Additional replicated trials will be established this year with five cooperating research stations in the provinces of Manitoba, Saskatchewan, and Alberta.

The native warm-season grass varieties of North Dakota origin have performed well in southern Manitoba. Ecotypes of warm-season grasses generally show improved vigor and size when moved 200–300 miles north of their area of origin and still show excellent seed production and longevity. However, further movement could result in winter injury, lack of vigor, and eventual loss of stand.

Adapted cultivars of warm-season grasses have done well on reclaimed lands when proper seeding technology has been implemented. Jim Kramer, Reclamation Specialist with BNI Coal, Center, North Dakota, thinks the new varieties of warm-season grasses adapted to the northern climate provide improved opportunities in mining reclamation. 'Killdeer' or 'Pierre' sideoats grama and 'Dacotah' switchgrass currently make up about 35 percent of all their native seeding mixtures. Other warm-season components include 'Bison' big bluestem, little bluestem, and blue grama—the latter two from native harvest only. Kramer places high priority on continued development of adapted northern varieties, especially little bluestem and blue grama. Kathie Diller, Environmental Scientist, Reclamation Division of the North Dakota Public Service Commission, agrees that warm-season grasses enhance seasonality and diversity on reclaimed lands. North Dakota regulations require mining companies to establish diverse, effective, and permanent cover which has the same seasonal variety native to the area.

Native warm-season grasses are being used to enhance diversity and seasonality of seedings for mined land reclamation by Basin Cooperative Services-Glenharold Mine, Stanton, North Dakota. (Photo by D. Nilson)

Development of northern origin warm-season varieties is ongoing by state and federal agencies in the Northern Great Plains. (Photo by D. Tober)

There is still work to be done in developing adapted cultivars of warm-season grasses for use in the Northern Great Plains. Native seed harvest of plant material from this region is unreliable, depending on climatic conditions. Northern origin varieties are still needed for blue grama, little bluestem, sand bluestem, and prairie sandreed. Progress is being made by state and federal agencies on these species.

The opportunity is tremendous for using improved northern origin, native warm-season grasses for range and pasture seeding, mining reclamation, wildlife habitat, and conservation purposes. Some of the many benefits include improved animal gains, enhanced wildlife habitat, erosion control, diversity and seasonality, long-term stability, drought hardiness, low maintenance, and aesthetic appeal. Adapted warm-season grasses are gaining popularity and "coming out from under the covers" in the cold climate of the Northern Great Plains.