THE
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

AND

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

AND

NORTH DAKOTA AGRICULTURAL
EXPERIMENT STATION

AND

MINNESOTA AGRICULTURAL
EXPERIMENT STATION

ANNOUNCE THE
RELEASE OF 'DACOTAH' SWITCHGRASS

'Dacotah' switchgrass (*Panicum virgatum* L.) was collected by the USDA ARS, Mandan, ND, and was developed and evaluated in cooperation with the USDA SCS Plant Materials Center, Bismarck, ND. It was tested under the experimental designation NDG-965-98 and has been assigned the plant inventory number PI 478002. The name Dacotah was chosen to represent the area of adaptation of the new cultivar to include climates similar to North Dakota and it is jointly released with the North Dakota Agricultural Experiment Station, Fargo, ND, and the Minnesota Agricultural Experiment Station, St. Paul, MN.

Original plants of Dacotah were collected in 1935 at a site near Breien, ND. It was apparent that the plants had been surviving and growing there for several years. Annual precipitation in the area averages 15 inches per year. The collected plants were grown at the USDA ARS Northern Great Plains Research Laboratory in Mandan, ND, in comparison with other collections. After 3 generations in open pollination nurseries, 10 plants were selected for uniform plant type with good leafiness, high plant vigor and seed yields, adaptation to northern climates, and uniform green color. Seed from these 10 plants were bulked to form the accession NDG-965-98, which was much earlier maturing than other accessions, and had better adaptation to climates of northern Minnesota and North Dakota. It was not outstanding in forage yield performance, but was placed in seed increase fields by the USDA SCS and has been evaluated at farm observation sites since its original composition. No further selection has been practiced on Dacotah over the years other than natural selection for hardiness and persistence during 2 generations of bulk increase at the USDA SCS Bismarck Plant Materials Center. Three hundred plants were chosen at random from a seed increase block at the Bismarck Plant Materials Center and vegetatively established in a permanent breeders seed block at the USDA ARS Northern Great Plains Research Laboratory. Chromosome number as determined from meristematic cells from 20 individual plants was $2n=4x=36$.

Dacotah is among the few cultivars to consistently produce mature seed at northern sites in North Dakota and Minnesota and will push the area of adaptation of switchgrass farther north than with presently available cultivars. Through extensive plot testing and field-scale evaluations, Dacotah appears well adapted to North Dakota and northern parts of Minnesota on sites where switchgrass is recommended. It is able to mature seed in these areas, is hardy and persistent, and can reproduce itself in low-maintenance stands. Its primary use will be in the Conservation Reserve Program and for grass waterways, stabilization of critical areas, and seeding in mixtures for some range situations and warm-season pastures. It may also be used for nature trails, rural beautification, and other plantings where establishment of native vegetation is an objective. Dacotah can be used in mixtures with other warm-season grasses such as big bluestem, indiangrass, little bluestem, and sideoats grama.

Dacotah was 27 days earlier in anthesis than 'Forestburg' at Fergus Falls, MN, for 2 years and 45 to 50 days earlier than other cultivars. Only Dacotah and 3 other cultivars produced mature seed at Fergus Falls. At Upham, ND, Dacotah usually had mature seed before other cultivars were in anthesis. The southern cultivars, 'Blackwell', 'Cave-in-Rock', and sometimes 'Pathfinder', usually never reached anthesis before fall frosts at Upham. Stand density was similar among cultivars. However, Dacotah tended to have a higher stand density at northern locations (Upham and Fergus Falls) than did cultivars originating south of these sites. Some evidence exists that Dacotah and Forestburg actually increase in stand density over time while other cultivars decrease at the northern locations. Dacotah tends to be shorter in mature plant height and have less rank growth than other cultivars. Over 18 location-years, Dacotah had the lowest forage yield among switchgrass cultivars and was usually the lowest at individual locations. Dacotah produced adequate forage at northern sites. Its early maturity, shorter height, and high density of residual vegetation provides excellent wildlife cover and nesting habitat as well as a dense sod for erosion control on drastically disturbed areas and transportation corridors.

Animal performance data have not been collected for Dacotah, but no selection pressure has been applied for quality traits and it would not be expected that Dacotah would be different from other cultivars that have not been selected for forage quality parameters. No quality problems and few problems with diseases and insects have been observed for Dacotah when grown in its area of adaptation in extensive on-farm, field-scale evaluations.

Breeder seed of Dacotah switchgrass will be maintained at the USDA ARS Northern Great Plains Research Laboratory, Mandan, ND 58554. Foundation and certified generations of seed increase beyond breeders seed are authorized. Foundation seed will be available from the USDA SCS Plant Materials Center, Bismarck, ND 58502.

Release date for publicity purposes shall be effective on the date of final signature of the release notice.

M. E. Carter APR 07 1989
Administrator — Date
United States Department of Agriculture
Agricultural Research Service
Washington, DC

Roy M. Gray 3/31/89
Chief — Date
United States Department of Agriculture
Soil Conservation Service
Washington, DC

H. R. Lund 2-13-89
Director — Date
North Dakota Agricultural
Experiment Station
Fargo, North Dakota

Ronnie L. Clark 2/14/89
State Conservationist — Date
United States Department of Agriculture
Soil Conservation Service
Bismarck, North Dakota

C. Eugene Allen 2/23/89
Director — Date
Minnesota Agricultural
Experiment Station
St. Paul, Minnesota

Gary R. Nordstrom 2/27/89
State Conservationist — Date
United States Department of Agriculture
Soil Conservation Service
St. Paul, Minnesota

PROPOSAL FOR RELEASE
OF
Dacotah Switchgrass

R.E. Barker, R.J. Haas, J.D. Berdahl, and E.T. Jacobson[1]

A. Name and Identification

Dacotah switchgrass (Panicum virgatum L.) was tested under the experimental designation NDG-965-98 and has been assigned the plant inventory number PI 478002. The name Dacotah was chosen to represent the area of adaptation of the new cultivar to include climates similar to North Dakota.

B. Origin and Breeding History

The original plants of Dacotah were collected by George Rogler in 1935 at a site near Breien, North Dakota. It was apparent that the plants had been surviving and growing there for several years. Annual precipitation in the area averages 15 inches per year. The collected plants were grown at the USDA-Agricultural Research Service Northern Great Plains Research Laboratory in Mandan, ND, in comparison with other collections. After 3 generations in open pollination nurseries, 10 plants were selected for uniform plant type with good leafiness, high plant vigor and seed yields, adaptation to northern climates, and uniform green color. Seed from these 10 plants were bulked to form the accession NDG-965-98, which was much earlier maturing than other accessions and had better adaptation to climates of northern Minnesota and North Dakota. It was not outstanding in forage yield performance, but was placed in seed increase fields by the USDA-Soil Conservation Service and has been evaluated at farm observation sites since its original composition. No further selection has been practiced on Dacotah over the years other than natural selection for hardiness and persistence during 2 generations of bulk increase at the USDA-SCS Bismarck Plant Materials Center. Three hundred plants were chosen at random from a seed increase block at the Bismarck Plant Materials Center and vegetatively established in a permanent breeders seed block at the USDA-ARS Northern Great Plains Research Laboratory. Chromosome number as determined from meristematic cells from 20 individual plants was $2n=4x=36$.

C. Botanical Description

Switchgrass is a tall, native, perennial, warm-season grass. Plants usually occur in large bunches, green or glaucous with numerous scaly creeping rhizomes. Culms are erect, tough and hard, 1 to 2 m tall. Sheaths are glabrous with leaf blades 10 to 60 cm long, 3 to 15 mm wide, flat glabrous, or sometimes pilose above or near the base, rarely pilose all over. The panicle is 15 to 50 cm long, open, sometimes diffuse and with spikelets that are 3.5 to 5 mm long and acuminate. The first glume is clasping, two-thirds to three-fourths as long as the spikelet, acuminate or cuspidate. The fruit is narrowly ovate and the margins of the lemma in-rolled at the base. Dacotah plant type is typical of the species.

Switchgrass is found in prairies and open ground, open woods, and brackish marshes. It produces well on subirrigated lowlands, on nearly level to gently undulating glacial till plains,

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overflow sites, level swales and depressions and bottomlands along rivers and streams. Distribution ranges from Nova Scotia and Ontario, Maine to North Dakota and Wyoming, south to Florida, Nevada, and Arizona; Mexico and Central America. In the Northern Plains, switchgrass is best adapted to deep, moist fertile soils of the eastern Dakotas, Nebraska, western Minnesota, and Iowa. Farther west in the region, it may be found in ravines, valleys, depressions, and other overflow areas favored by water runoff. **Dacotah** is among the few cultivars to consistently produce mature seed at northern sites in North Dakota and Minnesota and will push the area of adaptation farther north than with presently available cultivars.

D. Region of Adaptation and Proposed Use

Through extensive plot testing and field-scale evaluations, it has been determined that **Dacotah** is well adapted to North Dakota and northern parts of Minnesota on sites where switchgrass is recommended. It is able to mature seed in these areas, is hardy and persistent, and can reproduce itself in low-maintenance stands. Its primary use will be in the Conservation Reserve Program and for grass waterways, stabilization of critical areas, and seeding in mixtures for some range situations and warm-season pastures. It may also be used for nature trails, rural beautification, and other plantings where establishment of native vegetation is an objective. In addition, the height and density of the residual vegetation provides excellent wildlife nesting and cover habitat as well as a dense sod for erosion control on drastically disturbed areas and transportation corridors. **Dacotah** can be used in mixtures with other warm-season grasses such as big bluestem, indiangrass, little bluestem, and sideoats grama.

E. Evidence of Performance

At present, NDG-965-98 is being grown in its area of adaptation by farmers and ranchers who obtained seed from SCS field evaluation plantings. An identifiable primary source of seed is needed to maintain integrity of the cultivar. The main reason for release of **Dacotah** is its early maturity, which extends the area of adaptation of switchgrass farther north than with presently available cultivars. Ability to mature seed is a desirable trait for producing feed for birds in wildlife plantings and for maintaining productive stands. Its lower forage yield helps to avoid rank growth and litter buildup that sometimes limit utilization of switchgrass in northern climates.

Variety trial plots (15 x 100 ft) were grown in 1982 to 1987 at Upham, ND; Fergus Falls, MN; Ft. Pierre, SD; Ft. Sully, SD; Lake Andes, SD; and Rochester, MN. Four replications of a randomized complete block design were planted at each site, and performance measurements were made and analyzed from 3 replications. Origin of cultivars or entries included in the trials is presented in Table 1. **Dacotah** was 27 days earlier in anthesis than Forestburg at Fergus Falls for 2 years and 45 to 50 days earlier than other cultivars (Table 2). Only **Dacotah** and 3 other cultivars produced mature seed at Fergus Falls. At Upham, **Dacotah** usually had mature seed before other cultivars were in anthesis. The southern cultivars, Blackwell, Cave-in-Rock, and sometimes Pathfinder, usually never reached anthesis before fall frosts at Upham.

Stand density was similar among cultivars (Table 3). However, **Dacotah** tended to have a higher stand density at northern locations (Upham and Fergus Falls) than did cultivars originating south of these sites. Some evidence existed that **Dacotah** and Forestburg actually increased in stand density over time while other cultivars decreased at the northern locations, but caution should be used in interpretation of this observation because measurements were recorded for only 2 years at Fergus Falls and 3 years at Upham. **Dacotah** tends to be shorter in mature plant height and have less rank growth than other cultivars (Table 4).

Over 18 location-years, **Dacotah** had the lowest forage yield among cultivars and was usually the lowest at individual locations (Table 5). **Dacotah** produced adequate forage at northern sites. Early maturity allowed it to produce mature seed, and its ability over cultivars of southern origin to persist and maintain productivity will make it a valuable cultivar for conservation and wildlife plantings.

Animal performance data have not been collected for Dacotah, but no selection pressure has been applied for quality traits and it would not be expected that Dacotah would be different from other cultivars that have not been selected for forage quality parameters. No quality problems and few problems with diseases and insects have been observed for Dacotah when grown in its area of adaptation in extensive on-farm, field-scale evaluations. It has been well accepted by the public as an experimental line and now should be formally released with the official name of Dacotah switchgrass.

Table 1. Origin of switchgrass cultivars grown at 6 locations.

Entry	Origin
Dacotah	Morton Co, North Dakota
Forestburg	Sanborn Co, South Dakota
Sunburst	Southeast South Dakota
Neb-28	Holt Co., Nebraska
Summer	Otoe Co., Nebraska
Pathfinder	Kansas-Nebraska
Trailblazer	Nebraska
Cave-in-Rock	Illinois
Blackwell	Oklahoma

Table 2. Relative maturity of switchgrass cultivars grown at Upham, ND and Fergus Falls, MN.

Entry	Upham		Fergus Falls			
			1983		1984	
	1983	1984 1/	Anthesis	Mature	Anthesis	Mature
	Growth stage†		Days after July 15			
Dacotah	8.0	6.5	3	39	-3	33
Forestburg	5.0	3.8	30	70	24	68
Sunburst	4.5	3.5	30	73	24	68
Neb-28	4.5	4.0	30	73	24	68
Summer	3.5	1.0	39	-	31	-
Pathfinder	4.0	2.0	46	-	47	-
Cave-in-Rock	2.5	2.0	46	-	47	-
Blackwell	2.5	1.8	45	-	47	-

† Growth stage scored by the following scale:

1 = vegetative
2 = boot
3 = first emergence of inflorescence
4 = first anthesis
5 = 50% anthesis
6 = first seed ripe
7 = 50% seed size
8 = seed mature
9 = complete dormancy

1/ Mean of ratings from four (4) dates.

Table 3. Stand density of switchgrass cultivars grown at 6 locations.

Entry	Upham (3 yr)	Fergus Falls (2 yr)	Ft. Pierre (2 yr)	Ft. Sully (2 yr)	Lake Andes (1 yr)	Rochester (3 yr)	Mean (13 yr)
	Plants ft^{-2}						
Dacotah	31 a†	26 a	25 a	27 ab	29 a	23 ab	28 a
Forestburg	29 a	27 a	26 a	28 ab	34 a	23 ab	26 ab
Sunburst	19 b	20 bc	21 a	29 ab	29 a	15 de	21 bc
Neb-28	12 c	16 c	26 a	31 a	27 b	17 cde	22 bc
Summer	32 a	22 abc	13 b	21 b	27 a	17 cde	22 bc
Pathfinder	29 a	18 bc	20 a	27 ab	33 a	24 a	23 bc
Cave-in-Rock	20 b	18 bc	12 b	21 b	19 b	18 cd	18 cd
Blackwell	22 b	23 ab	23 a	25 ab	27 b	21 abc	22 bc
Trailblazer	--	--	21 a	--	--	12 ef	16 de

Plant Density was determined by counting plants in a 1 ft^2 frame from 10 random locations within a plot. Three (3) replications per entry were counted each year.

† Means having a letter in common do not differ significantly at $p \leq 0.05$ by Duncan's New Multiple Range Test.

Table 4. Mature plant height of switchgrass cultivars grown at 5 locations.

Entry	Upham	Fergus Falls[1/]	Ft. Sully	Lake Andes	Rochester	Mean
			-cm-			
Dacotah	110 abc[†]	98 a	94 a	130 a	102 a	106 b
Forestburg	112 abc	91 a	115 a	143 a	163 a	119 ab
Sunburst	123 a	107 a	100 a	122 a	132 a	115 ab
Neb-28	125 a	117 a	95 a	121 a	124 a	117 ab
Summer	117 ab	123 a	87 a	113 a	124 a	115 ab
Pathfinder	113 abc	107 a	133 a	146 a	137 a	124 a
Cave-in-rock	100 c	103 a	127 a	141 a	135 a	118 ab
Blackwell	105 bc	107 a	127 a	123 a	146 a	119 ab

† Means having a letter in common do not differ significantly at $P \leq 0.05$ by Duncan's New Multiple Range Test.

1/ Values presented are from a single year at each location except Fergus Falls which is the mean of 2 years.

Table 5. Forage dry matter production of switchgrass cultivars grown at 5 locations.

Entry	Upham (5 yr)1/	Fergus Falls (5 yr)	Ft. Sully (3 yr)	Lake Andes (4 yr)	Rochester (1 yr)	Mean (18 yr)
	lbs A^{-1}					
Dacotah	4572 c†	2883 b	3387 d	3756 d	2133 c	3588 c
Forestburg	6529 ab	3997 b	4606 c	5929 c	2598 bc	5153 b
Sunburst	7499 a	6794 a	5195 bc	6104 c	4323 abc	6433 a
Neb-28	7216 a	4143 b	4245 c	5971 c	2716 bc	5341 b
Summer	6910 a	6821 a	6048 abc	7543 a	4663 ab	6757 a
Pathfinder	7043 a	5604 a	6574 a	7143 ab	3724 abc	6403 a
Cave-in-Rock	5703 b	4151 b	4984 bc	6587 abc	5253 b	5323 b
Blackwell	6808 a	5805 a	6038 abc	7285 ab	5528 a	6436 a
Trailblazer	--	--	--	--	3429 abc	--

† Means having a letter in common do not differ significantly at $P \leq 0.05$ by Fisher's PLSD.

1/ Values presented are means from the number of years indicated in ( ).