United States Department of Agriculture
Natural Resources Conservation Service

Plant Materials Center
Bismarck, North Dakota

Technical Report, 2007

Part 1 of 2: Grasses, Forbs, and Legumes

Prairie junegrass
Koeleria macrantha

USDA-NRCS PLANTS Database / Hitchcock, A.S. (rev. A. Chase). 1950. *Manual of the grasses of the United States*. USDA Miscellaneous Publication No. 200. Washington, DC.

Helping People Help the Land

United States Department of Agriculture
Natural Resources Conservation Service
Bismarck Plant Materials Center

Technical Report

Part I (Grasses, Forbs, and Legumes)

2007

PART I

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INTRODUCTION

INTRODUCTION: TECHNICAL REPORT – 2007

Plant Materials Problems and Needs

The USDA, Natural Resources Conservation Service (NRCS), Plant Materials Center (PMC), Bismarck, North Dakota, primarily serves the States of North Dakota, South Dakota, and Minnesota. Activities are directed toward meeting the needs and priorities set forth in the three States' long-range programs.

Objectives and Functions

1. Identify, select, and improve plants to meet the resource conservation needs of the three States.

2. Determine cultural techniques for successful propagation and establishment of these plants.

3. Assemble and comparatively evaluate materials on and off the PMC.

4. Make comparative field plantings for final testing of promising plants and techniques with conservation districts and cooperators.

5. Work with universities, experiment stations, and other State and Federal agencies to cooperatively release improved conservation plants.

6. Produce limited quantities of foundation or foundation quality seed, which is made available to commercial seed growers for establishing seed increase fields.

7. Encourage conservation districts, commercial seed growers, and commercial and State nurseries to produce adapted plant materials and named cultivars.

8. Promote these materials in conservation programs.

PLANT MATERIALS CENTER LONG RANGE PLAN
BISMARCK, NORTH DAKOTA
2006-2010

I. Introduction

The mission of the Plant Materials Program is to develop and transfer effective state-of-the-art plant science technology to meet customer and resource needs. The purpose of the Plant Materials Program is to carry out specialized activities in resource conservation, as part of the overall program of the Natural Resources Conservation Service (NRCS). It is the responsibility of the Plant Materials Center (PMC) to:

1. Assemble, test, and release plant materials for conservation use.
2. Determine techniques for the successful use and management of conservation species.
3. Facilitate the commercial increase of conservation species.
4. Provide for the development and transfer of applied plant science technology to solve conservation problems.
5. Promote the use of plant science technology to meet the goals and objectives of the USDA and NRCS Strategic Plans.

The PMC Long Range Plan (LRP) identifies, guides, and directs PMC operation toward solving high-priority resource problems identified in the States' PMC LRP. The PMC LRP is consistent with goals and objectives identified in the NRCS Strategic Plan, National Plant Materials Program Strategic Plan, and State Strategic Plans. Recommended action items and specific products are identified in individual State Annual Plans which are reviewed and updated annually.

II. Long Range Plan Development

The LRP is in accordance with the revised National Plant Materials Manual, Part 540.22. This plan acts as a guide for directing PMC activities within Minnesota, North Dakota, and South Dakota. NRCS representatives from all three states met in Fargo, North Dakota, on March 8, 2006, to determine the basis for this plan. Feedback in the form of survey questionnaires was received from various NRCS offices, conservation districts, and partners in the three States. The *"Plant Materials Program Strategic Plan Survey Responses"* publication (2/7/05) was also used to provide insight and guidance to the decision making process.

General Description of the Service Area

Climate – USDA Plant Hardiness Zones 2, 3, 4, and 5 are within the area serviced. Precipitation is quite varied both in annual amount and in seasonal distribution, and predominantly occurs in the form of rainfall. Long-term average annual precipitation varies from 12 inches to 35 inches. The growing season ranges from 95 days to 155 days. The titles of the four Land Resource Regions include:

- Northern Great Plains Spring Wheat
- Western Great Plains Range and Irrigated
- Central Feed Grains and Livestock
- Northern Lake States Forest and Forage

A detailed description of the major land resource areas, land use, and climate may be found in the reference *"Land Resource Regions and Major Land Resource Areas of the United States,"* Agricultural Handbook 296.

III. Goals

Three broad-based goals have been identified.

Goal 1:

- Identify and evaluate plants and develop technology for their successful establishment and maintenance to solve natural resource problems.

Goal 2:

- Provide plant materials and plant technology that are economically feasible for solving conservation problems and to meet emerging energy and environmental needs.

Goal 3:

- Provide equal access for all Americans to the Plant Materials Program. All products and services must be delivered fairly and equitably. Promote the increased use of plant materials to address human health, safety, cultural, and aesthetic issues.

IV. Plant Materials Priorities and Resource Concerns

Native Prairie Ecosystems Restoration

- Identify additional species and develop sources.
- Develop establishment and management protocol.
- Market PMC releases.

Warm-Season Grass Promotion and Development

- Promote economic as well as conservation benefits.
- Promote the benefits of big bluestem.
- Promote proven management techniques to minimize invasive species.
- Select a switchgrass or other native species as alternatives to smooth bromegrass in grassed waterways.

Tree and Shrub Related Technology

- Increase species diversity in windbreaks.
- Identify/develop additional tall tree species.
- Identify/develop additional native shrub species.
- Identify and promote alternatives for invasive species.

Wetland and Riparian Plant Materials

- Identify/develop additional species.
- Develop establishment and management protocol.

Saline/Alkaline Tolerant Plant Materials

- Develop and distribute information.

Filter Strips/Nutrient Management

- Develop/promote effective plants for nutrient uptake.

Streambank and Lakeshore Stabilization

- Develop establishment and management protocol.

Information, Education, and Outreach

- Promote the value of PMC releases.
- Identify and promote perennial plants for wildlife food plots.
- Remarket older plant releases.
- Target specific outreach opportunities to non-traditional clientele.

Alternative and Specialized Use of Conservation Plants

- Utilize agroforestry technology.
- Recognize alternative income species.
- Promote switchgrass as a biomass fuel for energy savings.

Urban Conservation

- Provide information on effective species/varieties.
- Promote native landscaping as low energy and reduced maintenance.
- Sell the economic as well as the environmental benefits.

V. Partners and Cooperators

Plant Materials Program activities are conducted in cooperation with universities, State and Federal agencies, industries, conservation groups, soil and water conservation districts and associations, and others. The primary customers are the NRCS field offices in Minnesota, North Dakota, and South Dakota. Improved plant materials will be released with cooperating agencies, Agricultural Experiment Stations, and State crop improvement associations. Seed growers and conservation nurseries will be kept informed of the availability of new plants and production techniques.

Approved by: Bismarck Plant Materials Center Advisory Committee

8/31/06

WILLIAM HUNT, NRCS State Conservationist, St. Paul, Minnesota **Date**

8/31/06

JANET OERTLY, NRCS State Conservationist, Huron, South Dakota **Date**

8-31-06

J.R. FLORES, NRCS State Conservationist, Bismarck, North Dakota **Date**

Location

The Bismarck Plant Materials Center is located in south central North Dakota, near the center of the North American landmass. It is on the east bank of the Missouri River in a shallow basin 7 miles wide and 11 miles long. Elevation is 1,647 feet, latitude 46°46'N and longitude 100°45'W.

Physical Facilities and Evaluation Sites

The PMC does not own land but manages a total of approximately 138 acres split among three separate sites within 25 miles of each other. These locations are:

1. Lincoln-Oakes Nursery, Bismarck, North Dakota. The USDA, Natural Resources Conservation Service, Plant Materials Center operates under a cooperative working agreement with the North Dakota Association of Soil Conservation Districts (NDASCD). The Association owns and operates the Lincoln-Oakes Nursery which in turn provides the PMC with 70 acres of land located on the nursery. This site is primarily used by the PMC for foundation quality grass seed production. The PMC shares a building site with the Nursery, with the NRCS buildings located on the north part of the acreage. Buildings include an office, greenhouse, lathhouse, machine storage shed (housing tree and seed storage refrigeration units), seed cleaning building, chemical storage shed, and a second equipment storage building containing a small shop.

2. North Dakota Game and Fish Department, McKenzie, North Dakota. The Department, under cooperative agreement, provides the PMC with a 24-acre tract on the McKenzie Slough Game Management Area. Since 1972, this site has been used for the initial evaluation of woody plant material established in single row, non-replicated plots. It is now used for long-term observation of plant performance, as well as seed collection.

3. USDI Fish and Wildlife Service (FWS), Apple Creek Township, Burleigh County, North Dakota. The FWS has granted the use of 44 acres on a Waterfowl Production Area (WPA) near Apple Creek for woody test plantations and seed orchards. Three large assemblies of native shrubs, including chokecherry, buffaloberry, and hawthorn are established on this site.

4. Off-center evaluation sites in Minnesota, South Dakota and North Dakota. These 7 other off-center evaluation sites, located in the three-state area, are cooperative with various State and Federal agencies. These locations provide long-term testing sites for trees, shrubs, and grasses evaluated under uniform culture and management. Refer to map, page 12.

Soils

At the PMC, the soil type is a Mandan silt loam. The Mandan series typically consists of deep, well-drained soils formed in silty sediments on uplands and terraces. The surface layer is dark grayish-brown and grayish-brown silt loam 20 inches thick. The subsoil is grayish-brown silt loam 9 inches thick. The underlying material is 28 inches of light brownish-gray silt loam over light brownish-gray loam. Slopes range 0 to 7 percent. Ordinarily, surface runoff is medium and fertility is high. Controlling erosion is the major concern in management. Both soil blowing and water erosion are hazards. This soil is well-suited to small grain, corn, and alfalfa. Capability unit IIe5, windbreak group 3.

Climatological Information and 2007 Weather Summary

Climate of the area is semiarid, typically continental in character. During the summer, there are a few hot and humid days, but the winters are quite cold and fairly long. The relative humidity during the summer is generally low, and high temperature and high humidity are seldom experienced together.

Precipitation averages 16.84 inches per year. Refer to Table 1 (page 8) for 2007 weather data. More than 75 percent of this falls during the six-month period of April through September, and 50 percent normally falls in May, June, and July. Most summer precipitation occurs during thunderstorms that occur about 34 days per year. Damaging hail occurs about once in 10 years.

The winter season begins in late November and continues until late March. Nearly all winter precipitation is snow, often associated with strong winds and low temperatures. Snow has been reported for all months except July and August. Occasional winter blizzards can be severe.

Temperatures range from an average mean of 6.7 degrees F in January to a mean of 70.4 degrees F in July. During short periods, the temperatures may climb as high as 100 degrees F in summer or drop as low as -40 degrees F in winter. Frequent clear and partly cloudy days contribute to a high percentage of possible sunshine, with the total annual average about 2,700 hours out of a possible 4,470 hours. The average wind speed is a little less than 11 miles per hour, with a prevailing direction from the west-northwest. April and May are the windiest months. The average freeze-free period is 134 days from mid-May to late September.

Table No. AV-1: 2007 Weather Summary - Official Station - Bismarck, North Dakota

	Mean Temperature (degrees Fahrenheit)		Precipitation (inches) Actual		Deviation from Normal
Month	**2007**	**Normal***	**2007**	**Normal***	**2007**
January	14.7	10.2	0.13	0.45	-0.32
February	8.9	18.1	0.75	0.51	0.24
March	36.6	29.7	1.18	0.85	0.33
April	42.1	43.3	0.80	1.46	-0.66
May	57.4	56.0	5.42	2.22	3.20
June	67.0	64.7	3.32	2.59	0.73
July	75.5	70.4	1.25	2.58	-1.33
August	67.2	69.0	3.26	2.15	1.11
September	59.5	57.7	1.77	1.61	0.16
October	47.0	45.2	0.83	1.28	-0.45
November	31.1	28.0	0.13	0.70	-0.57
December	15.0	15.2	0.23	0.44	-0.21
Annual	**43.5**	**42.3**	**19.07**	**16.84**	**2.23**

*National Climate Data Center 1971-2000 Monthly Normals

	2007
Last Frost (28 degrees)	17-Apr
First Frost (28 degrees)	12-Oct
Frost Free Period	177 days

REGIONAL DESCRIPTION

REGIONAL DESCRIPTION: TECHNICAL REPORT – 2007

Major Land Resource Areas

The three States served by the PMC, North Dakota, South Dakota, and Minnesota, include portions of 23 Major Land Resource Areas in four Land Resource Regions. They are the Northern Great Plains Spring Wheat Region, Western Great Plains Range and Irrigated Region, Northern Lake States Forest and Forage Region, and the Central Feed Grains and Livestock Region.

Potential Natural Vegetation

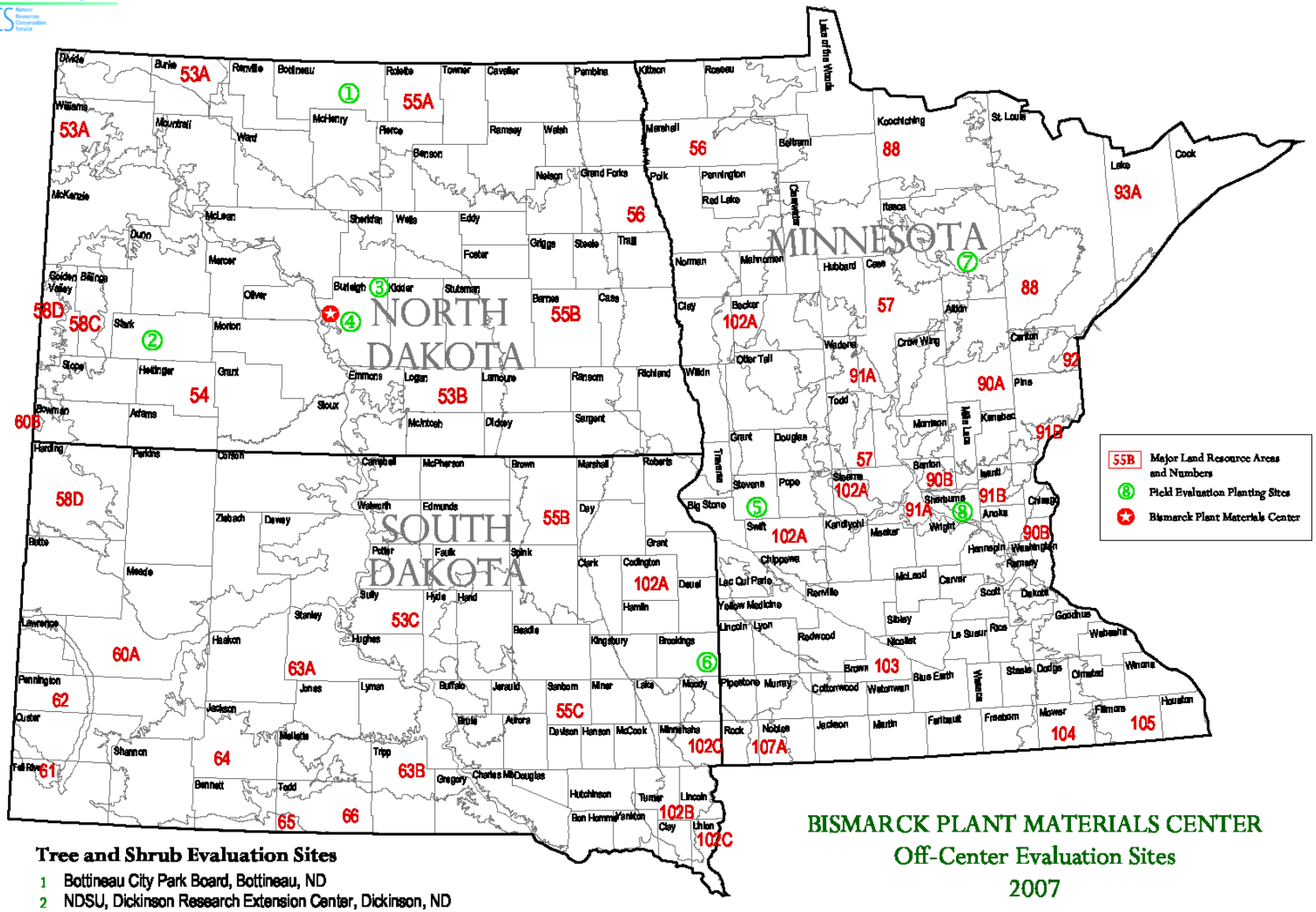
Most of central and western North and South Dakota support a mixed grass prairie of predominantly western wheatgrass (*Pascopyrum smithii*), green needlegrass (*Nassella viridula*), needleandthread (*Hesperostipa comata*), slender wheatgrass (*Elymus trachycaulus*), and prairie junegrass (*Koeleria macrantha*). Little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), plains muhly (*Muhlenbergia cuspidata*), sedge (*Carex*), and blue grama (*Bouteloua gracilis*) are the principal climax species on xeric soils, steeper eroded slopes or thin uplands. Prairie sandreed (*Calamovilfa longifolia*) is important on sandy soils throughout the region. Moist sites support such species as big bluestem (*Andropogon gerardii*) and prairie cordgrass (*Spartina pectinata*). Whitetop (*Scolochloa festucacea*), bulrushes (*Scirpus*), and common reed (*Phragmites australis*) are typical of lowland meadows and marshes. Western snowberry (*Symphoricarpos occidentalis*), rose (*Rosa*), buffaloberry (*Shepherdia argentea*), and chokecherry (*Prunus virginiana*) are abundant shrubs in draws and narrow valleys. Rocky mountain juniper (*Juniperus scopulorum*) is common in the western Badlands. Eastern South Dakota, southern Minnesota, and the Red River Valley support vegetation dominated by tall grass prairie species; principally big bluestem, switchgrass (*Panicum virgatum*), and Indiangrass (*Sorghastrum nutans*). Other important species include little bluestem, prairie dropseed (*Sporobolus heterolepis*), porcupine grass (*Stipa spartea*), green needlegrass, and prairie cordgrass. Bur oak (*Quercus macrocarpa*), basswood (*Tilia americana*), hackberry (*Celtis occidentalis*), cottonwood (*Populus deltoides*), and willow (*Salix*) follow major draws and floodplains.

Two distinct forested regions occur within the three-State area. The first is the Black Hills of South Dakota where Ponderosa pine forest (*Pinus ponderosa*) and pine/oak savannas dominate. The second is the northern and eastern sections of Minnesota, which support mixed hardwood and conifer forests. Principal species include oak (*Quercus*), maple (*Acer*), elm (*Ulmus americana*), aspen (*Populus*), jackpine (*Pinus banksiana*), red pine (*Pinus resinosa*), and balsam fir (*Abies balsamea*). Black spruce (*Picea mariana*), tamarack (*Larix laricina*), and white cedar (*Thuja occidentalis*) are typical of lowlands and swamps.

Climate and Species Adaptation

North Dakota and Minnesota are the two coldest States in the nation excluding Alaska. Mean annual temperatures range from 36 degrees F to 48 degrees F for all reporting stations. Plant hardiness zones (USDA) vary from 3 to 4 with mean minimum temperatures between -10 degrees F and -50 degrees F. Annual precipitation varies from 13 inches in western North Dakota to 30 inches or more in southeast Minnesota. Growing seasons are short, averaging from 110 to 150 days. The central and western Dakotas are principally semiarid in nature while the eastern Dakotas and Minnesota are considered subhumid.

MAPS



BISMARCK PLANT MATERIALS CENTER
Off-Center Evaluation Sites
2007

Tree and Shrub Evaluation Sites

1 Bottineau City Park Board, Bottineau, ND
2 NDSU, Dickinson Research Extension Center, Dickinson, ND
4 USDI Fish & Wildlife Service, Apple Creek Twp., Burleigh Co., ND
5 Univ. of Minn., West Central Research & Outreach Center, Morris, MN
6 Eastern South Dakota Soil & Water Research Farm, Brookings, SD
7 Univ. of Minn., North Central Research & Outreach Center, Grand Rapids, MN
8 Univ. of Minn., Sand Plain Research Farm, Becker, MN

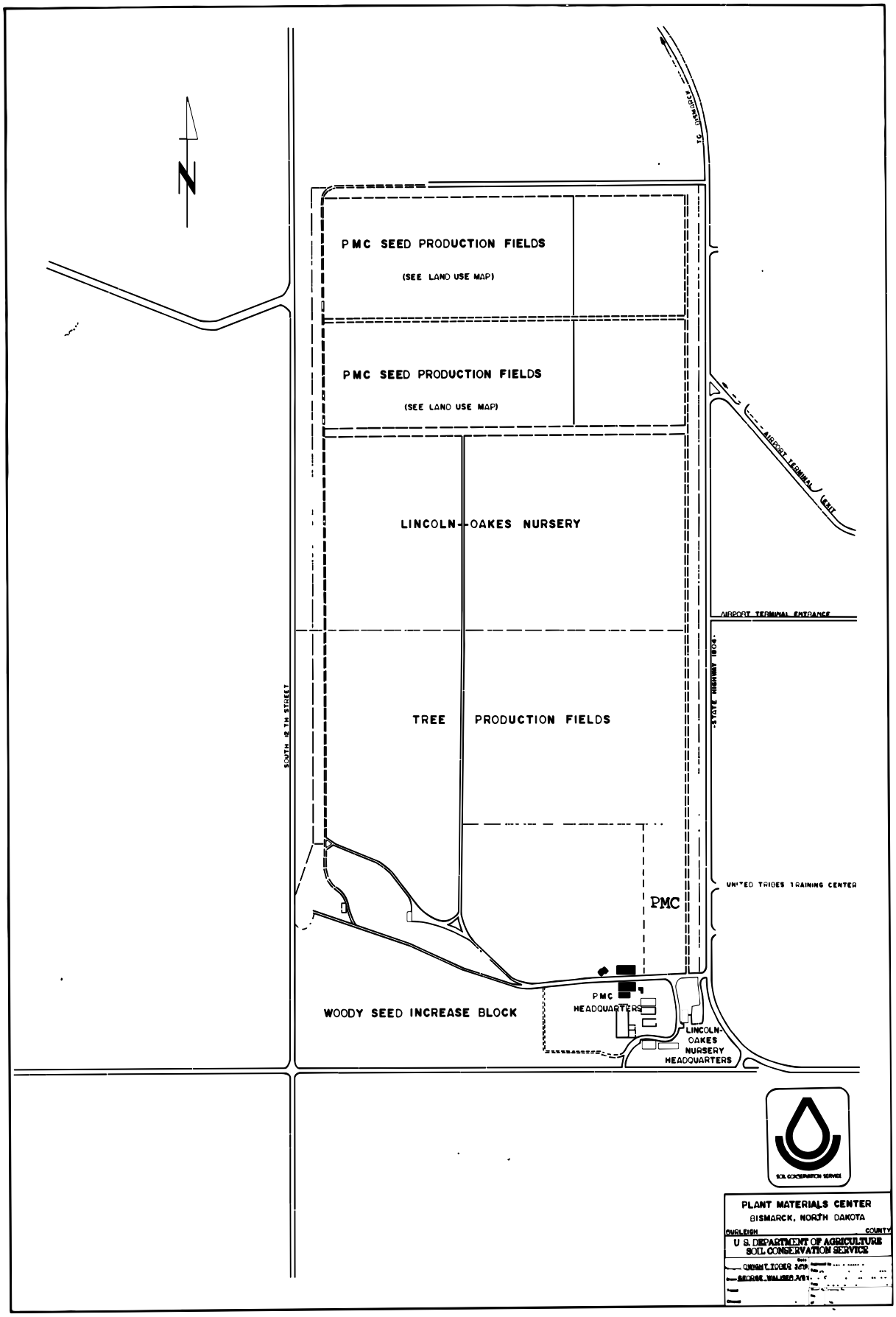
Herbaceous/Misc. Plants Evaluation Sites

3 North Dakota Game & Fish Department, Burleigh Co., ND

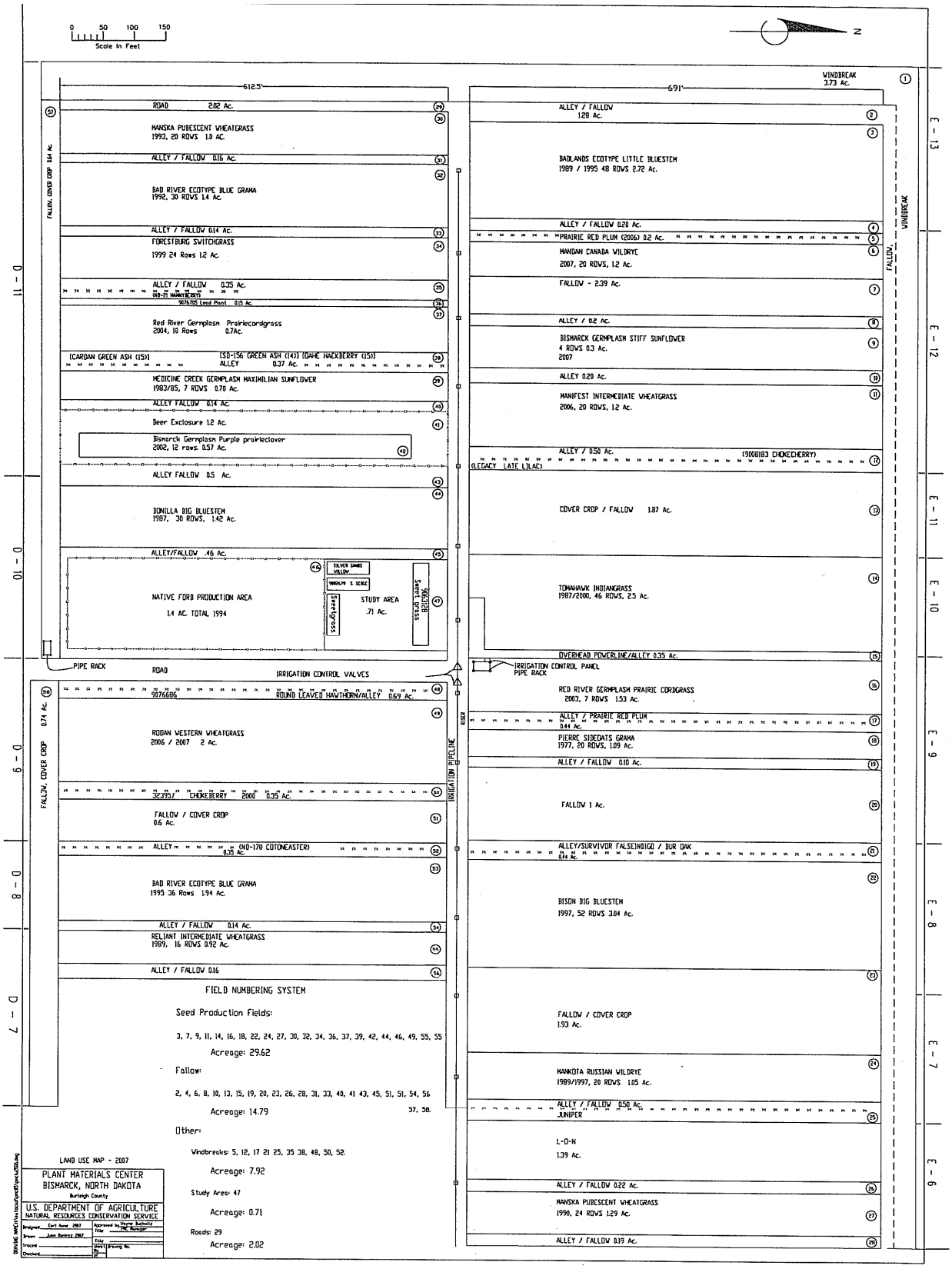
N

USDA-NRCS Bismarck State Office GIS Center, Bismarck, ND 2008

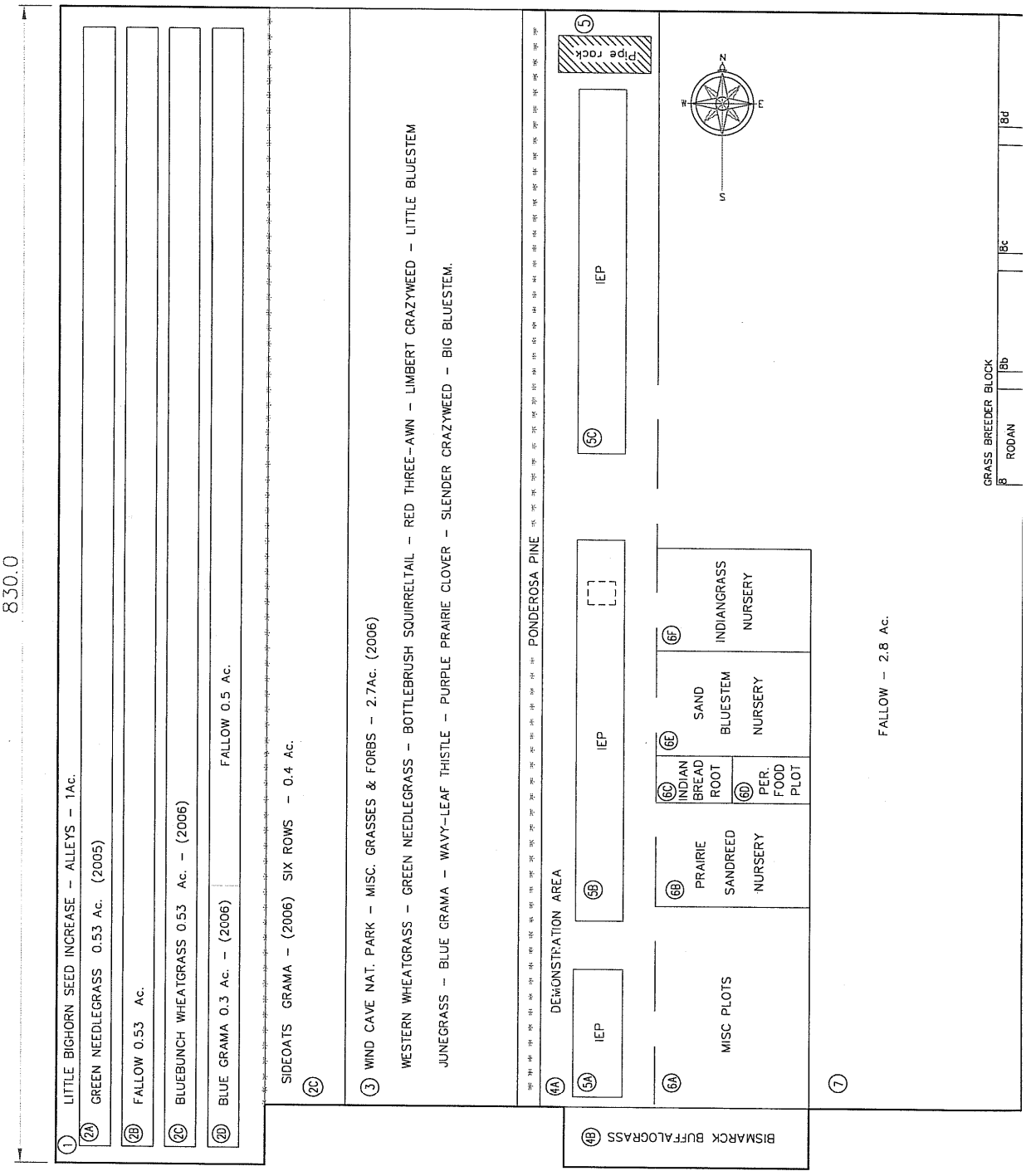
Revised March 2008


PMC SEED PRODUCTION FIELDS
(SEE LAND USE MAP)
PMC SEED PRODUCTION FIELDS
(SEE LAND USE MAP)
LINCOLN--OAKES NURSERY
TREE PRODUCTION FIELDS
WOODY SEED INCREASE BLOCK
PMC
PMC HEADQUARTERS
LINCOLN-OAKES NURSERY HEADQUARTERS
AIRPORT TERMINAL EXIT
AIRPORT TERMINAL ENTRANCE
STATE HIGHWAY 1804
SOUTH 42 TH STREET
UNITED TRIBES TRAINING CENTER
PLANT MATERIALS CENTER
BISMARCK, NORTH DAKOTA
BURLEIGH COUNTY
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PMC Land Use Map - 2007



PMC Land Use Map, Panel A - 2007



ACTIVE STUDIES

ACTIVE STUDIES: TECHNICAL REPORT 2007

Study NDPMC-P-0003-OT

Study Title: Evaluation of Culturally Significant Plants
White sage *Artemesia ludoviciana*

Introduction: Plants of cultural significance are important to preserve and make available for planting. *Artemesia ludoviciana*, also known as white sage, cudweed sagewort, Louisiana sagewort, and "man" sage (Cheyenne Indians) is a varied species with many subspecies. It is not the scope of this study to separate these subspecies. White sage was an important ceremonial plant to the Cheyenne and other Plains Indians. It was believed to drive away evil or bad spirits. It was used in sweat lodges to purify. Medicinal uses included treatment of stomach disorders, nosebleeds, coughs, rheumatism, foot odors, and horse sicknesses. It was also used in making mats and rugs.

Objective: The goal of our study is to have northern hardy white sage seed or vegetative material of known origin readily available to the public, particularly the Native Americans of North Dakota, South Dakota, and Minnesota. The material will have a broad genetic base. 'Summit' Louisiana sage was released by the Upper Colorado Environmental Plant Center and partners. Its origin is from 6300 feet elevation in Idaho. Its adaptability to lower elevations and more northern latitudes is not known. Plant material originating from local Reservations may be more adapted and culturally desirable.

Cooperators: USDA, Natural Resources Conservation Service

Description: The species is a rhizomatous, perennial that is sage-scented. It is 12 to 30 inches tall, has a white, woolly appearance and often forms large patches. The leaves are alternate along the stem and range in shape from lanceolate to elliptical and from entire to coarsely toothed. The surface is white, woolly on the underside, and can vary from smooth to woolly on the upper side. The color on the upper side can vary from white to dark green as it ages. The inflorescence is a panicle with many small heads.

Distribution: It is a very common species of plains, prairies, roadsides and foothills regions. It is sometimes considered a weedy species because of its common occurrence. It is native from western Ontario to British Columbia and in the United States from Wisconsin west to the Pacific Ocean and south to Mexico. It is generally found on well-drained sites. Its forage value is poor for cattle and fair for sheep. It is grazed by deer, elk, and pronghorn. Overgrazing causes this plant to increase on range sites.

Methods and Materials

Plot Location: Bismarck Plant Materials Center, Panel A

Major Land Resource Area**:** MLRA 53B, Central Dark Brown Glaciated Plains. Most of the area is in farms and ranches, and about two-thirds is cropland that is non-irrigated. The more sloping soils are native rangeland. Elevation ranges from 1,600 to 2,000 feet.

Soils: Mandan Silt Loam. Soils of the plot are very low in organic matter and are usually dry and compacted.

Climate: The average annual precipitation is 16.84 inches (refer pages 6-7), of which three-fourths falls from April to September. The average frost-free period is 134 days with minimum mean temperature of –30 to –40 degrees F.

Collections: Refer to Table WS-1 for information on collection origins. Collections were made from sites on or near five different Indian Reservations in South Dakota, North Dakota, and Minnesota. Two to three pieces of plant and root material were dug at each site. The bareroot pieces were brought back to the Plant Materials Center where they were potted into ½-1 gallon pots. After 1-2 months, the material was planted into the PMC Panel A field.

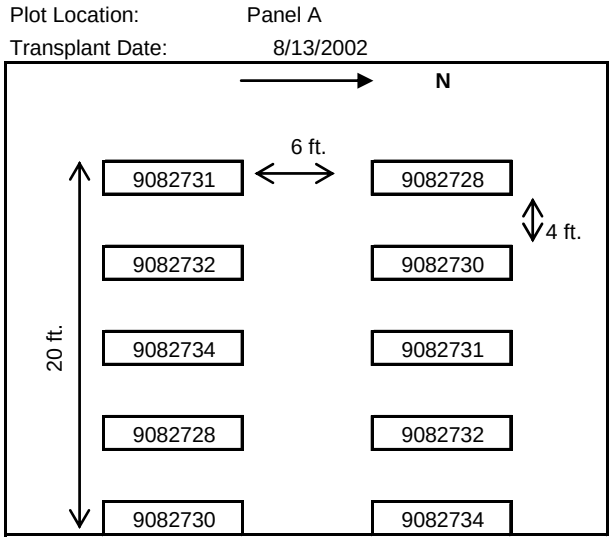
Planting Plan: Refer to Figure WS-1 for map of assembly.

Table WS-1. White sage *Artemesia ludoviciana* collection information.

Collection Date	Accession*	Reservation	Collector	Collection Location
7/11/2002	9082734	Standing Rock	Jensen	Sioux Co., ND 18-132N-79W, 2 mi east of Hwy 1806 along gravel to boat ramp
8/6/2002	9082732	White Earth	Tober	several miles S. of Ponsford, MN
6/26/2002	9082731	Pine Ridge	Tober	approx. 6 mi. S. of Belvidere, SD
6/14/2002	9082730	Sisseton	Tober	several miles NE of Ft. Sisseton, SD
7/8/2002	9082728	Turtle Mountain	Tober, Stange	6 mi. NW of Belcourt, ND

*2-3 pieces of rhizome for each accession were collected and planted into 1 gallon pots to grow until transplanting.
Soil and plant material was dug and brought to PMC for the Standing Rock Collection

Figure WS-1. Plot layout of white sage *Artemesia ludoviciana*.



Planting Date: The planting was made on 8/13/2002, except for the White Earth Collection which was planted in September 2002, because of a recollection of material.

Maintenance:

2003: Plot was hand weeded with no chemical weed control.

2004: Plot was hand weeded and dead plant material from previous growing season was clipped in late fall after a hard frost and plants were dormant

2005: Dead plant material was clipped off from 2004 growing season in very early spring. Planting was hand weeded and edges were roto-tilled.

2006: Dead plant material from 2005 was hand clipped in late winter. Plots were hand weeded and edges were tilled throughout the growing season.

2007: Dead plant material from 2006 was hand clipped in late winter. Plots were hand weeded and edges were tilled throughout the growing season. Weeds were minimal in 2007.

Evaluation:
2002: none
2003: see Table WS-2 for data collected.
2004: Individual plants were not evaluated. Plants have grown together and intertwined in the field. Propagation, using vegetative material was attempted in the greenhouse. A total of 38 plants were distributed in 2004.
2005: Plants were propagated from vegetative material and were shipped out for special plantings and demonstrations. A total of 250 plants were distributed for these plantings.
2006: Plants propagated in the greenhouse from rhizome cuttings were shipped for special plantings and demonstrations. A total of 207 plants were distributed.
2007: Plants were propagated in the greenhouse from rhizome cuttings and shipped for special plantings and demonstrations. A total of 180 plants were distributed. Plants were usually limited to 10 per order.

Table WS-2. White sage *Artemesia ludoviciana* evaluation data.

Data Date	Accession	Location	height (inches)	no. of stems	Spread (inches) (East-West)	Spread (inches) (North-South)
9/24/2003	9082728	south row	17	51	24	13
9/24/2003	9082728	north row	22	30	24	18
9/24/2003	9082730	south row	24	42	14	14
9/24/2003	9082730	north row	30	31	22	20
9/24/2003	9082731	south row	30	31	19	18
9/24/2003	9082731	north row	31	47	30	30
9/24/2003	9082732*	south row	27	20	9	9
9/24/2003	9082732**	north row	29	17	9	8
9/24/2003	9082734	south row	28	25	30	26
9/24/2003	9082734	north row	22	31	16	25

Propagation:
2004-2007: Plantlets with 2-3 true leaves were dug in late April of each year or when they were visible above ground. These plantlets do not appear until later in the spring. They were shoots from rhizomes. Once dug, plant materials was planted into a soilless potting mix in plastic pots (2½"L x 2½"W x 3" deep). The plantlets were allowed to grow in the greenhouse until mid to late May when they were then moved to a shade house to harden off before shipping. The plant material dug in 2006 was smaller than in previous years. New plant shoots were late to emerge from the field plot and were less abundant than in 2004 or 2005. The cool spring temperatures and the lack of soil moisture were contributing factors. In 2007, plants were again slow to emerge in the field plot.

Results and Conclusions

2002: All plants were surviving at the time of killing frost in mid October.
2003: Data collected included height, number of stems, and spread of the plants. Variation existed among the accessions in size and spread of plant. The accessions will be allowed to intertwine and rhizomes will be dug from the mixed bed beginning in 2004 for distribution.
2004: The parent plants have intertwined. Propagation was successful using the method described in the propagation section.

2005: Propagation was again successful in the greenhouse. Parent plants continue to thrive. Seed heads were formed on some accessions, but it was not determined if seed was set or viable. Success of demonstration plantings from propagated material was recorded.
2006: Plants were again successfully propagated. The field plot at the PMC was less dense with plants in 2006 than in 2004 or 2005. Plants were shorter and less vigorous, but did survive and produce seed heads. The growing conditions were extremely dry and hot in the growing season of 2006. The plot soils are also very low in organic matter and became very compacted.
2007: Plants were successfully propagated from rhizome cuttings. The rhizome material was small and somewhat dry when dug in late April/early May. The field plot was slow to grow in 2007, but growth was abundant later in the season, probably due to adequate moisture. Plants again produced seed heads. It is not known if any viable seed was produced, but most heads appeared devoid of filled seed.

Conclusions:

1) White sage can be successfully propagated from rhizome cuttings.
2) White sage is slow to begin growth in the spring (April-May).
3) White sage can survive very dry and hot conditions.

ACTIVE STUDIES: TECHNICAL REPORT 2007

Study NDPMC-P-0003-OT

Study Title: Evaluation of culturally significant plants
Prairie turnip *Pediomelum esculentum* (Pursh) Rydb.

Introduction: Prairie turnip, also known as breadroot scurfpea, Indian breadroot, and tipsin, was an important food source for Plains Indians in the past. It is native to the Great Plains from Canada to Texas. It is a short, perennial legume that has a tuberous, thickened taproot. Its leaves are palmately compound and the stems and leaves are hairy. Flowers are bluish-purple. The plant matures in early July (in the Northern Great Plains). The plant forms an abscission layer near the ground, and the plant breaks off and tumbles away. Prior to maturity, the roots were dug and eaten raw, cooked, dried or ground to flour. The plant also provided food for sheep and wildlife and diversity on the prairie.

Objective: Prairie turnip is no longer widely available for harvest from native prairies. The object of this study is to evaluate propagation methods and growth of the species. An assembly for seed increase may be considered, as well. This would provide a source of seed and planting techniques for food plots or revegetation work.

Methods and Materials

Collection/Assembly: The Plant Materials Center, along with other NRCS personnel began collection of seed in July 2003. Very limited amounts of seed were collected in 2003. Many of the plants had matured and tumbled away prior to the beginning of seed collection. Seed was again collected in 2004, 2005, and 2006. Collection amounts were very small, except for a collection made by Terrell Heilman in 2002. See Table PT-1 for collection information. Seed was collected by hand clipping heads or collecting the entire top portion of the plant. Seed was cleaned using a rub board or hand picking seeds from heads.

Propagation: In previous years, seed of prairie turnip has been planted to cone-tainers in the greenhouse. Seed was lightly scratched using sandpaper. Seed readily germinated, but it was difficult to maintain plants in the greenhouse environment. Plants either damped off or formed an abscission layer and the top broke off.

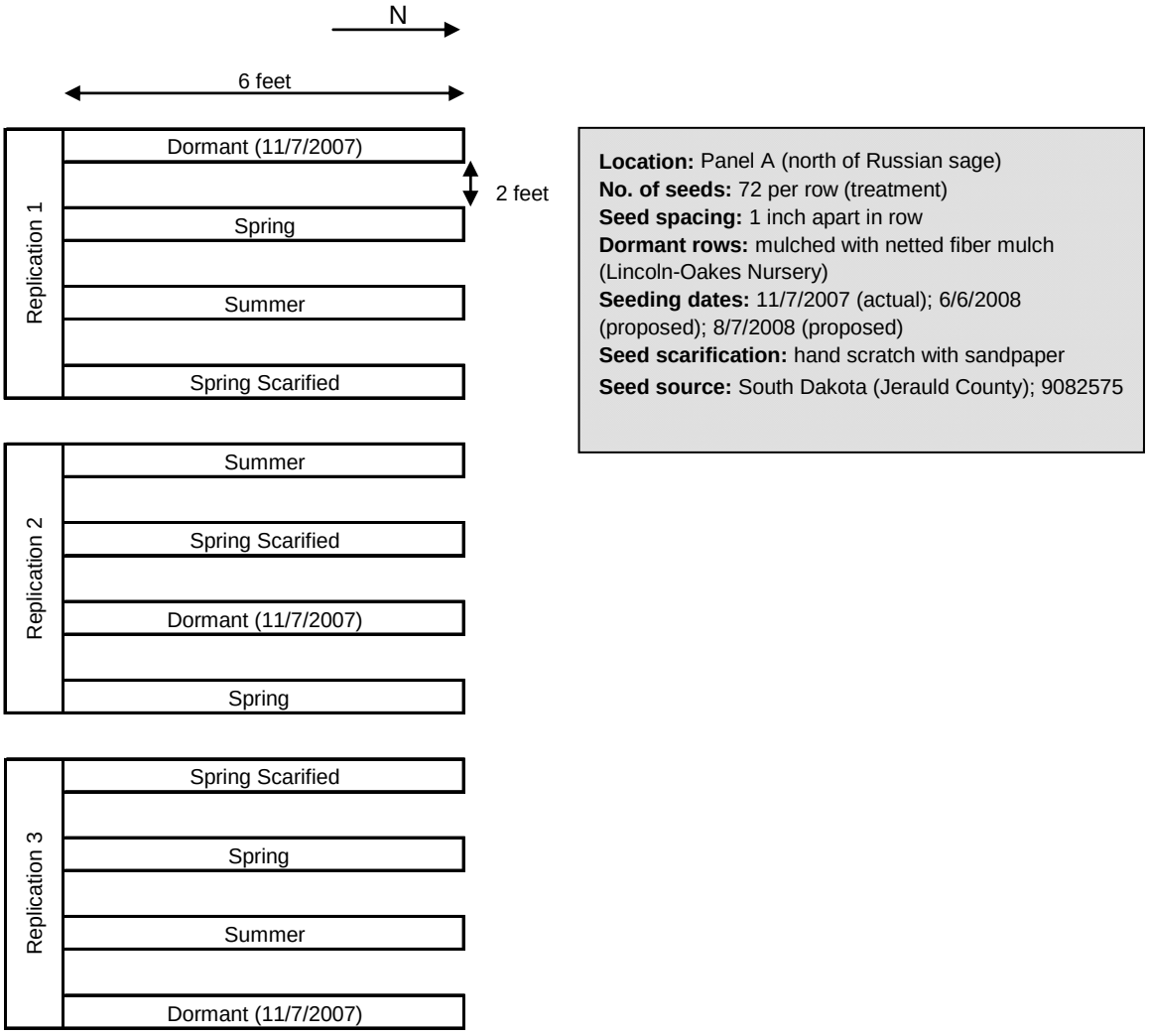
In search for other propagation methods, it was decided to seed directly to a field bed instead of planting from the greenhouse.

Field Propagation: As collections were very minimal by the end of 2004, the largest seed collection (accession 9082757, collected by Heilman) was used for the first field seeding trial rather than a composite of the collections. The seeding was a late fall dormant seeding so the seed was not scarified or treated prior to planting. The plot, in Panel A at the Bismarck PMC, was prepared by rototilling, packing and hand raking. Seed of prairie turnip was hand broadcast first over the prepared bed. A mix of grass seed including little bluestem, green needlegrass, and sideoats grama was then broadcast over the plot and seed was lightly hand raked. Once seeded, the plot was covered with a netted fiber mulch to prevent seed from blowing or washing in the winter and early spring. Mulch was removed in May. The plot at the PMC was planted on October 29, 2004. A plot using the same seeding rates and seed lots was planted at the Southeast Area SCD Research Farm, Brookings, South Dakota, by the NRCS field office. Table PT-2 lists details of the seeding at the Bismarck PMC.

Maintenance: Plots were hand weeded throughout the growing season of 2005, 2006, and 2007, mostly for annual weeds.

Seeding Date Study: A small study to evaluate seeding dates of prairie turnip was begun in the fall of 2007. The seed used for the study is accession 9082757. A dormant seeding was made on 11/7/2007. Other seedings to be completed in 2008 are: a spring seeding with no seed treatment, a spring seeding using mechanically scarified seed, and a summer seeding. Figure PT-1 shows the layout and size of the plot.

Figure PT-1. Field map and plot layout of prairie turnip *Pediomelum esculentum* seeding date study



Results and Discussion

2005-2006: Broadleaf weeds and stinkgrass were prevalent in the Bismarck plots. Weeds were removed before growing large enough to cause shading competition. Breadroot plants continued to emerge throughout the growing season of 2005. In 2006, the prairie turnip stand was more dense as were the grasses. Plants remained short and few flowered in 2006, probably due to drought conditions. The plot at Brookings, South Dakota, failed due to excessive weed competition in 2005.

2007: There were less annual weeds in the plots in 2007, compared to 2005 and 2006. More invading perennial grasses were growing in the plots, including hard fescue from the borders and wheatgrasses

invading from surrounding plots. The prairie turnip thrived in 2007. Many plants flowered, and a few on the edges set seed.

Roots were dug each year to look at tuber growth. Roots were dug 10/4/2005, 10/12/2006, and 10/2/2007. In 2005, the swollen portion of the tuber averaged ½ inch long and 1/8 inch across. In 2006, the swollen tuber averaged 2 inches long and ½ inch across. In 2007, the tuber size was approximately 1 inch wide and 2 inches long.

Table PT-1. Prairie turnip *Pediomelum esculentum* seed collection information.

Accession	State	County	Date		Location	Collector
9082750	ND	Morton	7/21/03		27-T137N-R81W Morton Co. Game Mgt.	N. Jensen, R. Bergsagel
9082751	ND	Sioux	7/21/03		NW1/4 12-T130-R81	K. Hall, A. Harrison
9082752	ND	Morton	7/20/03		NE1/4 31-T140-R83	W. Duckwitz
9082753	SD	Roberts	7/22/03		SE1/4 19-T125-R51	B. Bartelson, G.Thompson, J. TwoStar
9082754	SD	Pennington	7/18/03		16-T1S-R8E 7mi S of Rapid City	T. Warren
9082755	ND	Oliver	7/24/03		14-141-86, 12-141-83, SW31-141-81	L. Voight (on Earl Smith, R. Schwalble)
9082756	ND	Wells	7/24/03		NW1/4 13-147N-73W GMA 7 mi Herdsfield	D. Tober
9082757	SD	Jerauld	00/00/2002		NE1/4 SW1/4 13-107-65 near Wess. Springs	Terrel Heilman
9082758	ND	Benson, Eddy	8/1/03		20-151-65, 16-150-65 Ft. Totten	C. M. Carlson
9082759	ND	Benson	7/25/03		Spirit Lake Sioux Reservation	C. M. Carlson, P. Thompson, P. Halko
9082760	ND	McKenzie	7/26/03		21-148N-99W Horse pasture FR852	Cara Gildar
9082761	MN	Stevens	7/31/03		19-125N-41W along Pommede Terre River	Stan Musielewicz
9082762	SD	Marshall	7/18/03		NW1/4NE1/4 25-126-57	J. Schultz, T. Martin
9082764	SD	Harding	7/14/03		NW1/4 2-T19N R3E	L. Smith, B. Pihl
9082765	SD	Brookings	00/00/2003			D. Granbois
9082766	ND		8/5/03		22-143-82	J. Forman
9082767	ND		8/6/03		SE1/4 8-143-84	J. Forman
9082769	ND	Eddy	8/8/03		SW1/4 8-150-65	C. M. Carlson
9082795	SD	Corson	7/18/03		31-T20N-18E	A. Faulkner
9082796	SD	Sully	9/4/03		5-113N-81W	N. Jensen, D. Tober
9082879	SD		00/00/2003		near Eagle Butte	D. Pesicka
9082880	SD	Meade	7/23/03		south of Ft. Meade	Cheryl Nielsen
9082897	ND	Ft. Totten	7/26/04		NE1/4 8-T150N-65W	M. Carlson
9082898	ND	Morton	7/29/04		S1/2 20-T140N-R81W 5 mi N of Mandan	W. Duckwitz
9082899	MN	Stevens	7/13/04		19-T125N-R41W	J. Hellermann
9082900	MN	Stevens	7/22/04		N1/2SE1/4 19-T125N-R41W	J. Hellermann
9082901	ND	Stutsman	8/6/04		NW1/4 1-T62N-R140W	J. Forman
9082902	MN	Big Stone	8/25/04			K. Leddy
9082903	ND	Rolette	7/26/04		29-T162N-R73W	N. Hanretty

Table PT-1. Prairie turnip *Pediomelum esculentum* seed collection information. (continued)

Accession	State	County	Date		Location	Collector
9092027	MN	Stevens	7/18/05		Framnes Township	R. Spiering, J. Hellerman
9092144	ND	Burleigh	8/16/04		Horizon School	N. Jensen
9092145	SD	Harding	7/10/06		North Cave Hills Entrance, picnic area	N. Jensen, Harding Co. 4H
9092146	SD	Hutchinson	7/11/06		Dennis Wurst landowner	B. Woods, R. Rennolet
9092147	SD	Hutchinson	7/11/06		9-T57W-R99N	T. Sommer, B. Woods
9092148	SD	Ziebach	7/13/06		Donald Pesicka Ranch 4 mi NW of Dupree	D. Pesicka
9092149	ND	Barnes	7/25/06		2-T137N-R58W	J. Forman
9092150	ND	Griggs	7/28/06		3-T148N-R61W	J. Forman
9092151	ND	Griggs	7/26/06		2-T148N-R61W	J. Forman
9092152	ND	Dunn	8/16/06		1/2 mi W Little Mo. Park Hdqtr north of Killdeer	D. Tober
9092153	ND	Rolette	7/7/06		SW1/4 NW1/4 11-T161N-R71W	P. Gustafson
9092154	SD	Faulk	8/9/06		8 mi S and 1 mi W of Faulkton	N. Jensen, R. Bergsagel
9092155	MN		7/19/06		2 mi east of Ogema, MN	Dusty Jaskin (farm)
9092156	MN	Kandiyohi	7/18/06		12-T119N-R36W	Steve Smith
9092157	ND		8/14/04		18 mi NE of Carson, 1 plant	W. Duckwitz
9092158	SD	Beadle	6/26/04		4-T109N-R61W near James River	D. Schmidt
9092159	SD	Harding	7/7/04		NW Harding Co.	Mark Rohlfing (Belle Fourche)
9092160	ND	Stutsman	7/11/06		2-T141N-R64W	M. Anderson, J. Simonsen
9092161	ND	Mountrail	7/10/06		NW1/4 8-T154N-93W	K. Kallberg

Table PT-2. Seeding information for field plot (panel A) of Prairie turnip *Pediomelum esculentum*.

Species	Plot size ft^2	Seeding Rate seeds/ft^2	Full(#/ac) Seeding rate	%of Full Seeding rate	Seeds/lb	PLS # per plot	PLS	Bulk # per plot	X2 broadcast	Bulk gms per plot
Pediomelum esculentum	440	10		100	17,600	0.25	0.85	0.29		133.53
Schizachyrium scoparium	440	30	4.5	20	286,000	0.009231	0.8347	0.01		5.02
Nassella viridula	440	30	7.5	20	180,000	0.014667	0.8311	0.02		8.01
Bouteloua curtipendula	440	30	7	20	180,000	0.014667	0.944	0.02		7.05

ACTIVE STUDIES: TECHNICAL REPORT 2007

Study NDPMC-P-0104-RA

Study Title: Native Grasses for Conservation
Prairie dropseed *Sporobolus heterolepis*

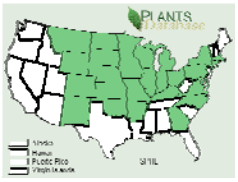
Introduction: Prairie dropseed is a warm-season native that grows in circular tufts. It has been described as quite palatable to livestock, decreasing with grazing pressure. It is desirable to wildlife; birds and rodents eat its large seed and small wildlife can use the plant for cover. It has been identified as a desirable species in landscaping. Native Americans made a poultice from the roots to apply to sores and a decoction of root was taken to remove bile. Although seed is being sold for landscaping, and some local collections are being grown, a northern hardy release of this species for conservation use is not known. Such a release would provide a consistent and larger supply of this species for planting in the Northern Great Plains.

Objective: The purpose of this study is to evaluate adaptability and growth habit of prairie dropseed. If the collections produce seed and prove adaptable and useful as a conservation species, a public release of northern hardy material will be the goal.

Cooperators: USDA, NRCS Plant Materials Center, Bismarck, North Dakota

Description: Prairie dropseed is a warm-season perennial that grows in circular tufts. Plants appear to form colonies in the wild. The seed head is an open pyramid shaped panicle. There are usually only a few seeds produced per plant. When in flower, these plants produce a vanilla-like odor. The seeds are small, round, shiny and hard, and drop when mature in August and September. There are approximately 1,200,000 seeds per pound. The leaves are narrow and 8-20 inches long and are mostly basal and hairless and radiate from the center of the tuft.

Distribution: Prairie dropseed is usually found in lighter textured soils of moist, mixed grass prairie communities. In the tall grass prairies, it often flowers only when stimulated by mowing or burning. It prefers sites where there is little competition from other grasses.



Methods and Materials

Collection/Assembly: Seed collections used in the study are:

1) Accession: 9082623. Burleigh County, ND SE ¼ of 3-144N-78W-A few grams (less than 5 gm) of seed was collected each year. Collections were made on 10/98, 9/8/99, 8/18/00 and 8/29/01. This site is the Russell Stuart Wildlife Management Area and is managed by the North Dakota Game and Fish Department. Seed was collected to the north and south of the Prairie Restoration seeding done by the PMC.

2) Accession: 9082741. Mahnomen County, MN, Wambuck WMA, 5½ miles north of Mahnomen and 1½ miles east. A few grams (less than 5 gm) of seed were collected from several plants on 10/19/01 at this site.

3) Accession: 9092028. Seed was collected by Rachel Bergsagel and Nancy Jensen. Collection date: 9/27/2005. Collected in Day County, South Dakota, at the entrance of Pickerel Lake (448th Ave.) in a low flat area on the south side of the entrance road, near a large wetland (Sec. 23, T124N, 53W). Seed was collected by hand stripping from numerous plants. Approximately 50 grams of seed were collected.

Planting Plan: Panel A, Plant Materials Center

The field has many small rocks, which appear to have been brought into the site.

Seeds of accession 9082623 (ND) were propagated in the greenhouse in cone-tainers in 2000. Thirty plants from this propagation were planted in panel A at the PMC in June of 2000. The plants were planted in one row and spaced one foot apart. In 2001, 25 additional plants were propagated and transplanted to extend the previous row. At the end of the growing season in 2002, 51 plants remained.

Seed of accession 9082741 was propagated in the greenhouse in 2002 and transplanted to panel A adjacent (south side) to the row of 9082623 (ND). Space between the two rows is approximately 5 feet. Approximately 35 plants were planted at 1½ to 2 feet apart, because of the limited number of plants. At the end of the growing season in 2002, 31 plants remained.

Seed of accession 9092028 was cleaned using hand screens and SD seedblower. The seed was propagated in the greenhouse in 2006 and transplanted in the spring of 2006 to panel A in a row five feet to the south of the Minnesota collection (9082741) row. Approximately 50 plants were transplanted to the field. Spacing between plants was one to two feet.

Planting Date: June 2000, June 2001: accession 9082623 (ND); June 2002: accession 9082741 (MN); June 2006: accession 9092028 (SD)

Maintenance: Plots have been hand weeded and shallow tilled between rows. No chemical has been applied. Vegetative residue was removed by hand clipping either in late fall or early spring the following year. In 2005, the residue was burned in early April. Residue was burned in the late fall in 2006.

Germination Trial:

Seed Sources: The three seed sources used in this trial were the following lots: SCO-07-9082623 (North Dakota), SCO-07-9082741 (Minnesota), and SCO-07-9092028 (South Dakota). Seed was cleaned with an office mill. Once clean, seed was separated with the heavier seed used for the germination test. Seed was separated using a SD seedblower, the smallest tube. Approximately 1/4 teaspoon of seed was placed in tube. Air was opened to 3 cm. Seed remaining on bottom was designated heavy seed. Seed from top was then separated again by blowing 1/4 tsp with air set at 2 cm open. This was designated as medium weight. Seed was blown for 1 minute for each 1/4 teaspoon of seed.

Experimental Design: Four boxes (100 seeds each) of heavy seed for each seed source (accession) and four boxes (100 seeds each) of medium seed for each seed source (accession) totaling 24 boxes at each germination date.

Germinator Seeding Dates: 10/10/2007 (actual); 4/10/2008 (proposed); and 10/10/2008 (proposed)

Germinator Settings: Light and 30 degrees C for 8 hours alternated with darkness and 20 degrees C for 16 hours.

Duration of each test: Twenty-eight days with counts at 14, 21, and 28 days

Evaluation, Results, and Discussion

Evaluation:

9082623(ND)

2000: Germination was fair in the greenhouse. No seed treatment was done prior to planting. Once transplanted, the plants were slow to grow the first year. Plant height was about 6 inches at the end of the growing season. Survival was greater than 80 percent based on general visual observations. No record was made of plants flowering this year. There were a few token heads.

2001: Plant growth was good this year. No data was recorded other than seed harvest. Seed was produced on plants transplanted in 2000. Seed was harvested on 9/10/2001. Yield was approximately 45 grams. There were approximately 50 plants. Plants appeared free of disease.

2002: Plants were flowering on 8/13/2002. Average height of seed heads was 22 inches. Plant height without heads averaged 7 inches. The leaves averaged 13 inches in total length, measured from the crown. Seed was hand harvested on 9/10/2002. After cleaning, there was approximately 250 grams of clean bulk seed. Most plants in the row set seed. Forty of the 51 plants had seed heads. The plants that did not set seed were very small and did not show much growth in 2002. The many small rocks on the site may have inhibited growth of some plants. Plants with seed heads were very uniform in seed production and height. Leaves showed no sign of disease.

2003: Leaf length and seed culm height were measured on 9/22/2003 (see Table PD-1). The average length of the leaf was 16 inches and the average seed culm height was 30 inches. Plants were vigorous in 2003. Seed harvested was approximately 211 bulk grams. Plants appeared to have shorter seed heads and leaves more abundant and finer than for the MN collection.

2004: Seed was collected by handstripping on 9/30/2004. Approximately 500 grams of seed were harvested. As both the South Dakota and North Dakota sources flowered this year, the seed harvested is probably a cross between the two accessions.

2005: Seed was harvested September 15-21, 2005. The plants were very robust and seed heads abundant and leaves very long. Seed harvested is probably a cross with the Minnesota collection. Approximately 1,000 grams of seed were harvested.

2006: Seed was harvested 9/28/2006. Seed harvested was probably a cross with the Minnesota collection. Approximately 245 grams of seed were harvested.

2007: Seed culm production was rated and culm height and leaf length was recorded for each plant of the accession (see Table PD-1). Seed was hand-stripped on 10/2/2007. Approximately 390 grams of bulk seed remained after cleaning.

9082741(MN)

2002: Plants transplanted to the field in 2002 were vigorous. A few seeds produced heads.

2003: Plants were vigorous. Seed was hand harvested on 9/22/03. A total of 119 grams of clean bulk seed was harvested. Plants were very upright and seed stalks were slightly longer than the ND collection. Leaf length and seed culm height were measured on 9/22/2003 for all plants (see Table PD-1). Average length of the leaf was 11 inches and seed culm height was 32 inches. There were fewer seed heads and plants had fewer leaves. These were younger plants than the ND collection, which may have been a contributing factor.

2004: Seed was hand stripped on 9/30/2004. Approximately 350 grams of seed were harvested, which is probably a cross with the North Dakota collection.

2005: Seed was harvested Sept 15-21, 2005. Plants were very robust, heads large, and leaves long. The seed of the Minnesota accession appeared to be slightly larger than the North Dakota accession. Seed ripened slightly later. Approximately 780 grams of seed were harvested.

2006: Seed has harvested 9/28/2006. Seed was probably a cross with North Dakota accession. Approximately 250 grams of seed were harvested.

2007: Seed culm production was rated and culm height and leaf length was recorded for each plant of the accession (see Table PD-1). Seed was hand-stripped on 10/2/2007. Approximately 368 grams of bulk seed remained after cleaning.

9092028(SD)

2006: Seedlings of the South Dakota collection were very slow to grow in the greenhouse. At transplanting time in late June/July the plants were very small. Plants were hand watered due to drought conditions. Plants of the South Dakota collection remained very small and a few had to be replaced.

2007: Plants were more vigorous in 2007, but growth was still slow initially. Seed culm production was rated and culm height and leaf length was recorded for each plant of the accession (see Table PD-1). Seed was hand-stripped on 10/2/2007. Approximately 38 grams of bulk seed remained after cleaning.

Plants of the North Dakota and Minnesota collections were stressed in 2006 due to drought but still grew and produced seed. Plant growth was much more vigorous for all three accessions in 2007, probably due to improved moisture conditions.

Results/Conclusions:

There are subtle phenological differences among plants, but most are of similar size and shape. Plants appear to be much larger and robust in a tilled, spaced plant row setting compared to a native prairie. Lack of competition for light, moisture, and space may be some reasons for the differences. Buildup of thatch in native stands may also hinder growth.

Managing residue with fire appeared to stimulate and enhance growth of prairie dropseed. The optimum frequency of burning, however, needs additional evaluation.

Seed size differences were found in harvested seed. When selecting a population for release, seed size will be considered, as larger seed usually is more vigorous. Seed set and flowering time will also be important factors to evaluate. Longevity of seed viability in storage has also been questioned and will be investigated in future years.

In upcoming years, seed set and flowering time will be important factors to evaluate. Longevity of seed storage has also been questioned and will continue to be evaluated (see Table PD-2 for germination trial results). The goal of the project is to produce a genetically diverse source of prairie dropseed.

Table PD-1. 2003 Data, Prairie dropseed (*Sporobolus heterolepis*). Eleven randomly selected plants of the North Dakota accession were measured for leaf length and 11 different plants were measured for seed height. All plants of Minnesota origin were measured.

Accession	Origin	Leaf length (inches)	Head Height (inches)
9082741	MN	12	34
9082741	MN	16	43
9082741	MN	13	27
9082741	MN	12	33
9082741	MN	M	M
9082741	MN	7	25
9082741	MN	8	20
9082741	MN	M	M
9082741	MN	M	M
9082741	MN	14	36
9082741	MN	12	36
9082741	MN	12	32
9082741	MN	12	41
9082741	MN	12	33
9082741	MN	12	36
9082741	MN	10	32
9082741	MN	10	32
9082741	MN	9	25
9082741	MN	13	31
9082741	MN	12	33
9082741	MN	9	34
9082741	MN	7	21
9082741	MN	10	27
9082741	MN	12	34
9082741	MN	12	36
9082741	MN	11	39
9082741	MN	12	38
9082741	MN	14	39
9082741	MN	12	34
9082741	MN	11	39
9082741	MN	10	34
9082741	MN	12	38
9082741	MN	10	24
9082741	MN	10	32
9082741	MN	5	24
9082741	MN	12	32
9082741	MN	12	30
9082741	MN	8	16

Accession	Origin	Leaf length (inches)	Head Height (inches)
9082623	ND	15	35
9082623	ND	16	30
9082623	ND	14	26
9082623	ND	15	32
9082623	ND	18	32
9082623	ND	18	36
9082623	ND	15	32
9082623	ND	16	30
9082623	ND	14	26
9082623	ND	16	28
9082623	ND	15	22

Table PD-2. Praire dropseed *Sporobolus heterolepis* germination trial results.

Planting		10/24/07	10/31/2007	11/6/2007			(in 100)	
Date	**Box**	**14 Day**	**21 Day**	**28 Day**			**TOTAL**	
10/10/07	ND-H1	9	20	20			49	
10/10/07	ND-H2	10	14	24			48	
10/10/07	ND-H3	17	21	24			62	
10/10/07	ND-H4	7	24	29			60	
					Ave%	54.75		219
10/10/07	MN-H1	12	22	32			66	
10/10/07	MN-H2	16	15	24			55	
10/10/07	MN-H3	8	23	27			58	
10/10/07	MN-H4	11	23	23			57	
					Ave%	59		236
10/10/07	SD-H1	0	3	34			37	
10/10/07	SD-H2	0	13	20			33	
10/10/07	SD-H3	0	9	29			38	
10/10/07	SD-H4	2	13	51			66	
					Ave%	43.5		174
10/10/07	ND-M1	12	19	19			50	
10/10/07	ND-M2	14	17	30			61	
10/10/07	ND-M3	12	17	35			64	
10/10/07	ND-M4	13	13	30			56	
					Ave%	57.75		231
10/10/07	MN-M1	9	15	20			44	
10/10/07	MN-M2	17	16	18			51	
10/10/07	MN-M3	17	18	21			56	
10/10/07	MN-M4	16	13	17			46	
					Ave%	49.25		197
10/10/07	SD-M1	0	5	3			8	*
10/10/07	SD-M2	0	3	30			33	
10/10/07	SD-M3	0	9	21			30	
10/10/07	SD-M4	3	9	14			26	
					Ave%	29.666667		89

*not included in average (dried out)
H=Heavy seed (air at 3 cm in SD seedblower), M=Medium seed (air at 2 cm in SD seedblower)
MN=Minnesota, ND=North Dakota, SD=South Dakota
Seed used for the study was harvested on 10/2/07

ACTIVE STUDIES: TECHNICAL REPORT 2007

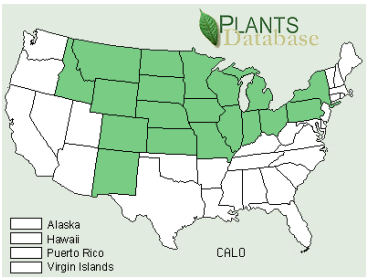
Study NDPMC-P-0401-RA

Study Title: Native Grasses for Conservation
Prairie sandreed *Calamovilfa longifolia*

Introduction: Prairie sandreed is a warm-season native perennial grass of well-drained soils. It is very rhizomatous, making it a good soil stabilizer. It occurs naturally in the mid grass prairies. It is fair for forage and hay, even with its coarse, tough textured leaves and stem. Species for stabilizing sandy soils are limited. Release of an adapted prairie sandreed would offer an additional species for these sites.

Objective: The purpose of the study is to develop a named release of prairie sandreed that has a broad genetic parentage, and is adapted to the Northern Great Plains, particularly eastern North Dakota and South Dakota and western Minnesota. Selection criteria will include, but not limited to leaf and stem disease tolerance, seed production, winter hardiness, and forage production. Releases currently available are Goshen, Pronghorn, and Koch Germplasm. At Bismarck, North Dakota, Goshen, originating from drier conditions in Wyoming is susceptible to foliar diseases. ND-95, a germplasm from North Dakota was also found susceptible to leaf rust. Pronghorn originated from Kansas and Nebraska sources, making its winter hardiness questionable in the more northern portions of the Northern Great Plains. Koch Germplasm has not been tested at Bismarck.

Cooperators: USDA, NRCS Plant Materials Center, Bismarck, North Dakota



Species Description/Distribution: Prairie sandreed is a warm-season perennial grass. It is native from portions of Canada, south to Kansas and Colorado, east to Illinois and Iowa, and west to Idaho. It is strongly rhizomatous and leaves are smooth, course and tough. The seed head is an open panicle. It grows naturally on dry, well-drained soils in sandy, gravelly, or rocky soils.

Materials and Methods

Collections: Seed collection began in the fall of 2003. Targeted locations included sites in Minnesota, and central and eastern South Dakota, and North Dakota. Table PS-1 is a list of collections for 2003. Seed was collected from more than 10 plants at a site. Seed quality of the collections was poor.

Assembly: Seeds were propagated in the greenhouse in March 2004. The late greenhouse planting was due to heating problems. Seed was planted to flats and then seedlings were planted to cone-tainers. Seedlings were then hand transplanted to the field (Panel A) in July 2004. Seedlings were small at the time of transplanting. Seedlings were planted in a randomized complete block with three replications. Goshen and ND-95 were used as checks in the assembly. Koch Germplasm was not available at the time of planting.

Planting Date: Seedlings were transplanted to the field (Panel A) on 7/6/2004.

Site Location: Panel A. The site was tilled and free of growing weeds at the time of planting.

Field Map: See Figure PS-1 for plot layout.

Maintenance:

2004: Plot was hoed and shallow tilled with garden tiller throughout the growing season. No chemicals were applied. Plants were watered by hand in 2004 to keep new seedlings alive.

2005: Plot was hoed and shallow tilled with garden tiller throughout growing season. No chemicals were applied. Plants were irrigated once in the summer of 2005. Residue was removed in the fall of 2005 by hand clipping, leaving 3 to 4-inch stubble.

2006: Plot was hoed and shallow tilled with garden tiller throughout the growing season. No chemicals were applied. Plants were irrigated once (July) in the growing season to sustain the plants in drought conditions. An attempt to burn residue from the individual plants in early November was not successful. Plant residue resisted burning. Plots were hand clipped to 3 to 4-inch stubble height to remove residue.

2007: Plot was shallow tilled and hand hoed. Any residue that was not removed in 2006 was had clipped in April and May of 2007. Canada thistle was spot sprayed with glyphosate throughout the growing season.

Evaluations:

2004: Plants had a slow start in 2004. Survival was noted in September 2004. No other data was collected.

2005: In 2005, data was collected on 8/26/2005, for various growth characteristics including spread, height, vigor, disease, and number of seed culms.

2006: In 2006, data on various growth characteristics was collected on 8/4/2006. Disease and lodging were noted on 9/20/2006.

2007: Data was collected for each plant on 8/7/2007, with a few additional notes taken later in the growing season. See Table PSR-3 for plant data. Data was analyzed and plants were selected to potentially be part of breeder block.

Results and Discussion

Plants within an accession did not always perform in a similar manner. This was expected as plants were propagated from seed, making genetics different. Due to these differences, each plant was evaluated individually.

Plants were very slow to establish and mortality was high in 2004. Plants that survived and grew in 2005 were vigorous and began spreading by rhizomes. Plants varied in spreadability. There was variation in leaf width and coarseness of the plant as well. In 2005, foliar and leaf diseases manifested in certain plants. Disease was not as noticeable in 2006 compared to 2005, but some plants did exhibit severe infestations by the end of the growing season. The dry climatic conditions of 2006 were likely contributing factors. Rhizome growth and vegetative growth were strong for both years. Disease in 2005 was noted, with some accessions severely affected with stem and leaf diseases.

Plants were vigorous in 2007. The differences in size and color of plants were quite noticeable. Plant disease was prominent for some accessions, causing the plants to lodge and leaves and stems to blacken. Some plants showed very little disease. Selections based on visual observations were noted. Data from all years and the visual selections were analyzed to make selections for a breeders block. Datat will be taken on the selected plants in 2009. Forage quality, disease, and flowering date will be the primary parameters for data collection in 2008. Any plants showing poor performance in 2008 will be re-evaluated when selecting the final population to be planted in the breeders block.

Table PS-1. Prairie sandreed *Calamovilfa longifolia* collection information.

Accession	State	County	Section-Township-Range	Collector	Date
9082770	SD	Lyman	35-107N-72W	Tober, Jensen	9/4/2003
9082771	SD	Corson	29-20N-18E	Evenson	9/23/2003
9082772	ND	McHenry	13-153N-76W	Knudson	9/24/2003
9082773	SD	Sanborn	31-108N-61W	Jensen	9/9/2003
9082774	SD	Roberts	19-122N-52W	Jensen	9/8/2003
9082775	SD	Ransom	14-135N-53W	Jensen	9/8/2003
9082776	SD	Pennington	13-1S-8E	Bradbury, Warren	8/29/2003
9082777	ND	Morton	5 mi NW of Mandan, ND	Duckwitz	9/13/2003
9082778	SD	Kingsbury	30-112N-56W	Jensen	9/10/2003
9082779	SD	Faulk	33-117N-69W	Jensen	9/11/2003
9082780	SD	Campbell	5-125N-76W	Jensen	9/11/2003
9082781	ND	Adams	11-129-92	Klein, Timm	9/2/2003
9082782	SD	Brookings	12-112N-48W	Jensen, Tober	9/3/2003
9082783	SD	Marshall	30-127N-59W	Jensen	9/9/2003
9082784	SD	Brown	26-128N-60W	Jensen	9/9/2003
9082785	SD	Stanley	36-6N-30E	Tober, Jensen	9/4/2003
9082786	SD	Sully	5-113N-81W	Tober, Jensen	9/5/2003
9082787	SD	Tripp	9-99N-78W	Tober, Jensen	9/4/2003
9082788	MN	Sherburne	24-34N-29W	Gullickson	9/4/2003
9082789	MN	Sherburne	16-34N-29W	Hugo	9/4/2003
9082790	MN	Sherburne	31-34N-28W	Hugo	9/4/2003
9082791	MN	Sherburne	34-34N-27W	Hugo	9/4/2003
9082792	SD	Mellette	15-40N-29W	Schoon	9/19/2003
9082793	SD	Todd	2-39N-30W	Schoon	9/19/2003
9082794	SD	Todd	26-36N-31W	Schoon	9/19/2003
9082813	MN	Kittson	Lake Bronson	Tober	9/8/2003
9082814	MN	Polk	Agassiz Dunes	Tober	9/10/2003
9082815	MN	Norman	Prairie Smoke Dunes	Tober	9/10/2003
9082816	MN	Clay	Bluestem Prairie	Tober	9/10/2003
9082817	MN	Otter Tail	Inspiration Peak Wayside Park	Tober	9/8/2003
9082818	MN	Douglas	Lake Christina-north shore	Tober	9/8/2003
9082819	MN	Wabasha	7-109-9	Oja	9/22/2003
9082820	MN	Chisago	8-33N-21W	Oja	9/9/2003
9082821	MN	Anoka	2-33N-23W	Oja	9/9/2003
9082822	MN	Chisago	8-33N-21W	Oja	9/9/2003
9082823	MN	Anoka	1-33N-23W	Oja	9/9/2003
9082825	ND	Oliver	½ mile north of Cross Ranch State Park	Tober	10/22/2003
9082826	ND	McHenry	2-75-154	Duckwitz	9/9/2003

Figure PS-1. Prairie sandreed *Calamovilfa longifolia* plot layout.

West ↑

	Rep 1				Rep 2			Rep 3		
Row 1	**Row 2**	**Row 3**	**Row 4**	**Row 5**	**Row 6**	**Row 7**	**Row 8**	**Row 9**	**Row 10**	**Row 11**
ND95	2817	2818	Goshen	ND95	2789	2784	Goshen	2818	2788	2820
2820	2778	2815	2816	2825	2813	2826	2773	2817	2783	ND95
2825	2776	2813	2782	2783	2818	2774	2774	2814	2784	2816(2)
2780	2771	2793	2823	2792	2775	2776	2771	2815	2781	2787(1)
2783	2774	2789	2822	2814	2773	2817	2772	2813	2780	2786(2)
2788	2773	2784	2779(2)	2778	2772	2794	2775	2794	2825	2823(2)
2792	2772	2781	2790	2771	2777	2788	2776	2792	2826	2822(3)
2794	2775	2826	2787	2821	2815	2780	2778	2793	2821	2786(1)
2814	2777	2821	2786	2781	2793	2820	2777	2789	Goshen	2790(1)
										2816(2)
										2787(1)

Location: Panel A

Planted: 7/6/2004

Seedlings were grown in the greenhouse. Seedlings were in very poor condition when field was planted.

Row spacing: 3 1/2 feet between plants and 3 1/2 feet between rows

The prefix for each accession is 908
Accessions are in 3-plant plots unless designated in ( ).

Table PSR-2. Prairie sandreed *Calamovilfa longifolia* collection information for selected plants.

Accession	Row	Plant Number	Origin (State)	Origin (County)	Collector	Location
9082771	5	3	SD	Corson	Evenson, Dennis	sec. 29-T20N-R18E
9082772	8	1	ND	McHenry	Knudson, Mike	sec. 13-T153N-76W
9082773	6	1	SD	Sanborn	Jensen, Nancy	sec. 31-T108N-61W
9082773	6	2	SD	Sanborn	Jensen, Nancy	sec. 31-T108N-61W
9082775	6	1	ND	Ransom	Jensen, Nancy	sec. 14,23-T135N-R53W
9082775	8	1	ND	Ransom	Jensen, Nancy	sec. 14,23-T135N-R53W
9082779	4	1	SD	Faulk	Jensen, Nancy	sec. 33-T117N-R69W
9082781	10	2	ND	Adams	Klein, Jim and Jodi Timm	sec. 11,14-T129N-R92W
9082783	1	3	SD	Marshall	Jensen, Nancy	sec. 30-T127N-59W
9082784	3	2	SD	Brown	Jensen, Nancy	sec. 25,26-T128N-60W
9082784	3	3	SD	Brown	Jensen, Nancy	sec. 25,26-T128N-60W
9082787	4	1	SD	Tripp	Tober, Jensen	sec. 9-T99N-R78W
9082788	10	2	MN	Sherburne	Gullickson, Betsy	sec. 24-T34N-R29W
9082793	3	3	SD	Todd	Schoon, Leland	sec. 2-T39N-R30W
9082814	9	2	MN	Polk	Tober, Dwight	Agassiz Dunes SNA(TNC)
9082815	3	3	MN	Norman	Tober, Dwight	Prairie Smoke Dunes SNA
9082815	6	1	MN	Norman	Tober, Dwight	Prairie Smoke Dunes SNA
9082818	6	2	MN	Douglas	Tober, Dwight	north shore of Lake Christina
9082820	1	2	MN	Chisago	Oja, Mark	sec. 8-T33N-R21W
9082825	1	1	ND	Oliver	Tober, Dwight	north of Cross Ranch State Park
9082826	3	2	ND	McHenry	Duckwitz, Wayne	sec. 2-T154N-R75W

Figure PS-2. Three-state map showing county origins of the selected prairie sandreed *Calamolvilfa longifolia* accessions.

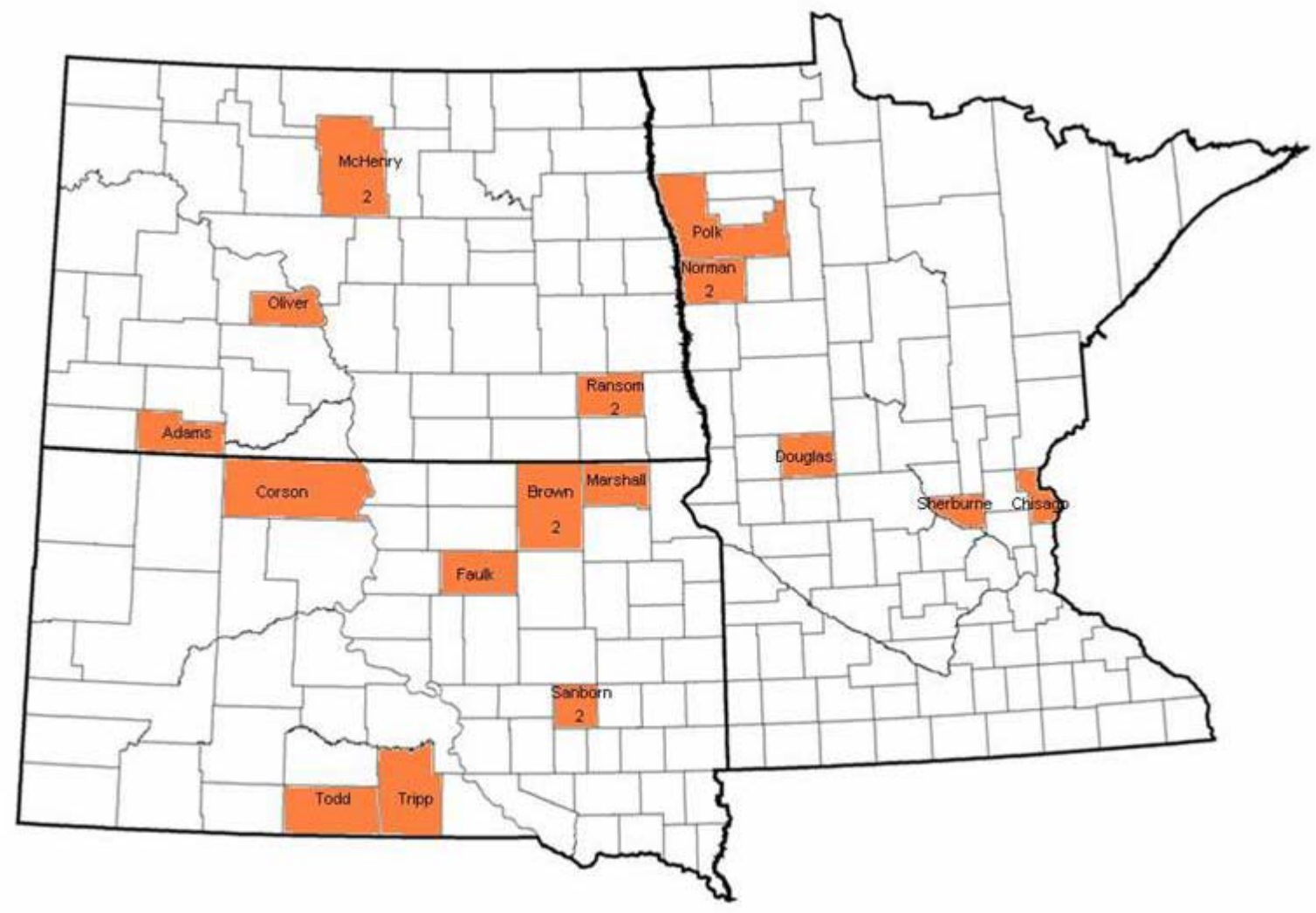


Table PSR-3. Prairie sandreed *Calamovilfa longifolia* evaluation; 2005, 2006, and 2007 data.

Key:

1-3 rating scale

Leaf width: 1=narrow, fine; 3=wide, coarse
Leafiness: 1=many leaves; 3=few leaves
Disease: 1=lack of disease; 3=severe
Seed culms: 1=many; 3=few or none
Lodging: 1=none; 3=severe
Size: 1=large, robust; 3=small

1-9 rating scale

Leafiness: 1=many leaves; 9=few leaves
Disease: 1=lack of disease; 9=severe
Vigor: 1=excellent vigor; 9=poor vigor

Plants selected for breeder population (2007)

*Accn=accession (908 prefix) **sel=selected for conservation in 2007 ***lsp sel=selected for landscaping in 2007

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/26/05	2771	2	1	48	18	4	4	1	**3**	**3**		6	**3**					
08/04/06	2771	2	1	67		22	19	2	1		2							
08/07/07	2771	2	1						1	3	2			2	2			
08/26/05	2771	2	2	42	13	8	6	2	**4**	**3**		2	**4**					
08/04/06	2771	2	2	64		12	9	1	2		1							fine, small
08/07/07	2771	2	2						2	2	2			1	2			fine leaves
08/26/05	2771	2	3	58	11	3	3	2	**5**	**3**		4	**4**					
08/04/06	2771	2	3	87		13	12	2	3		1							
08/07/07	2771	2	3						1	1	1			2	1			very tall, slightly coarse
08/26/05	2771	5	1	52	10	12	22	1	**3**	**2**		7	**3**					
08/04/06	2771	5	1	75		22	30	3	1		1							disease
08/07/07	2771	5	1						1	3	2			3	1			
08/26/05	2771	5	2	66	12	13	9	2	**2**	**2**		19	**2**					
08/04/06	2771	5	2	91		31	30	3	1		1							disease not severe
08/07/07	2771	5	2						1	3	2			2	1			
08/26/05	2771	5	3	56	11	6	7	1	**3**	**7**		6	**3**					
08/04/06	2771	5	3	62		22	23	2	1		1							leafy, slight disease
08/07/07	2771	5	3						1	1	1			2	2	x		
08/26/05	2771	8	1	58	16	9	5	1	**2**	**3**		9	**2**					
08/04/06	2771	8	1	57		35	35	2	1		1							disease, leafy

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/07/07	2771	8	1						1	3	2			2	1			
08/26/05	2771	8	2	72	8	13	13	1	**5**	**3**		6	**4**					
08/04/06	2771	8	2	75		23	25	3	3		2							disease
08/07/07	2771	8	2						2	2	2			2	2			
08/26/05	2771	8	3	63	8	15	12	3	**3**	**2**		12	**4**					
08/04/06	2771	8	3	70		34	25	2	2		2							disease slight
08/07/07	2771	8	3						2	2	2			1	2			
08/26/05	2772	2	1	0	12	3	3	2	**6**	**4**		0	**5**					
08/04/06	2772	2	1	41		16	17	2	3		3							heads compressed
08/07/07	2772	2	1						1	3	2			1	3			very coarse leaves
08/26/05	2772	2	2	DEAD														
08/26/05	2772	2	3	0	6	0	0	3	**8**	**1**		0	**9**					
08/04/06	2772	2	3	DEAD														
08/26/05	2772	6	1	DEAD														
08/26/05	2772	6	2	22	8	6	5	1	**4**	**4**		2	**5**					
08/04/06	2772	6	2	40		13	15	2	1		2							
08/07/07	2772	6	2						1	1	2			1	3		x	leafy
08/26/05	2772	6	3	DEAD														
08/26/05	2772	8	1	64	8	6	11	2	**4**	**2**		16	**3**					
08/04/06	2772	8	1	61		24	23	3	2		2							disease slight
08/07/07	2772	8	1						1	2	2			1	1	x		
08/26/05	2772	8	2	32	7	9	8	2	**5**	**2**		1	**5**					
08/04/06	2772	8	2	61		24	25	3	2		2							
08/07/07	2772	8	2						1	2	2			1	1	x		
08/26/05	2772	8	3	28	9	6	10	3	**3**	**2**		1	**4**					
08/04/06	2772	8	3	53		18	22	2	2		2							stressed
08/07/07	2772	8	3						1	2	2			1	2			
08/26/05	2773	2	1	0	17	4	4	2	**5**	**2**		0	**4**					
08/04/06	2773	2	1	44		10	10	1	2		3							diseased, boot
08/07/07	2773	2	1						1	1	2			1	3			
08/26/05	2773	2	2	0	13	7	5	3	**6**	**3**		0	**6**					
08/04/06	2773	2	2	50		22	11	2	3		2							disease

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/07/07	2773	2	2						2	2	2			2	3			
08/26/05	2773	2	3	55	15	14	8	2	**4**	**5**		4	**3**					
08/04/06	2773	2	3	79		17	24	1	2		1							disease, lodge
08/07/07	2773	2	3						1	2	1			2	2			
08/26/05	2773	6	1	61	11	8	11	2	**4**	**2**		5	**3**					
08/04/06	2773	6	1	70		24	18	2	2		2							blue, leafy
08/07/07	2773	6	1						1	1	1			1	1	x		upright
08/26/05	2773	6	2	64	10	17	12	3	**3**	**2**		11	**3**					
08/04/06	2773	6	2	66		25	24	2	3		2							lodged
08/07/07	2773	6	2						1	1	1			2	2	x		
08/26/05	2773	6	3	57	12	11	4	3	**2**	**6**		3	**3**					
08/04/06	2773	6	3	79		21	19	2	1		1							leafy
08/07/07	2773	6	3						1	1	2			1	2	x		
08/26/05	2773	8	1	DEAD														
08/26/05	2773	8	2	30	10	22	17	2	**3**	**4**		1	**4**					
08/04/06	2773	8	2	54		20	20	2	1		1							leafy, blue, upright
08/07/07	2773	8	2						1	2	1			1	1	x		
08/26/05	2773	8	3	0	24	11	9	2	**5**	**2**		0	**5**					
08/04/06	2773	8	3	48		13	10	2	1		3							leafy, blue, slight disease
08/07/07	2773	8	3						1	2	2			1	2			
08/26/05	2774	2	1	0	11	4	4	3	**5**	**2**		0	**6**					
08/04/06	2774	2	1	45		18	16	1	2		2							fine, blue, small
08/07/07	2774	2	1						2	1	2			1	3			upright, fine leaves
08/26/05	2774	2	2	DEAD														
08/26/05	2774	2	3	36	7	10	3	3	**6**	**2**		3	**5**					
08/04/06	2774	2	3	49		17	9	1	2		1							fine leaf and heads, boot
08/07/07	2774	2	3						2	2	2			1	3			upright, fine leaves
08/26/05	2774	7	1	DEAD														
08/26/05	2774	7	2	0	12	10	4	3	**6**	**2**		0	**6**					
08/04/06	2774	7	2	47		19	12	2	3		2							small
08/07/07	2774	7	2						1	2	2			2	2			
08/26/05	2774	7	3	22	6	7	5	3	**5**	**2**		1	**5**					

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/04/06	2774	7	3	39		13	13	2	3		2							disease severe
08/07/07	2774	7	3						1	2	2			2	2			
08/26/05	2774	8	1	0	10	4	5	3	**6**	**4**		0	**6**					
08/04/06	2774	8	1	31		10	9	2	2		2							small upright, slight disease
08/07/07	2774	8	1						1	1	1			1	3		x	fine leaved
08/26/05	2774	8	2	36	7	10	7	3	**3**	**2**		5	**4**					
08/04/06	2774	8	2	36		18	12	2	3		1							disease
08/07/07	2774	8	2						1	2	2			2	2			
08/26/05	2774	8	3	0	10	7	4	3	6	2		0	6					
08/04/06	2774	8	3	30		12	10	1	2		2							disease, small plant
08/07/07	2774	8	3						1	1	2			1	3		x	
08/26/05	2775	2	1	DEAD														
08/26/05	2775	2	2	37	10	8	10	1	**2**	**2**		3	**3**					
08/04/06	2775	2	2	78		22	17	2	2		2							fine center leaves
08/07/07	2775	2	2						1	1	2			2	2			
08/26/05	2775	2	3	0	17	3	3	1	**3**	**2**		0	**4**					
08/04/06	2775	2	3	55		9	10	2	2		2							boot
08/07/07	2775	2	3						1	1	2			1	3			
08/26/05	2775	6	1	58	11	11	8	2	**2**	**5**		11	**3**					
08/04/06	2775	6	1	55		19	26	2	2		1							disease on lower Leaves
08/07/07	2775	6	1						1	1	1			1	2	x		coarse
08/26/05	2775	6	2	55	11	10	7	1	**2**	**2**		1	**3**					
08/04/06	2775	6	2	65		23	23	1	1		2							
08/07/07	2775	6	2						1	2	2			1	2			
08/26/05	2775	6	3	75	11	5	6	2	**2**	**2**		12	**2**					
08/04/06	2775	6	3	81		18	20	2	2		1							
08/07/07	2775	6	3						1	1	2			2	2			
08/26/05	2775	8	1	79	12	15	6	2	**3**	**2**		11	**2**					
08/04/06	2775	8	1	84		29	30	3	2		1							leafy, clean
08/07/07	2775	8	1						1	1	1			1	1	x		
08/26/05	2775	8	2	61	9	16	11	2	**2**	**2**		12	**2**					

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/04/06	2775	8	2	60		23	25	2	1		2							leafy
08/07/07	2775	8	2						1	2	1			3	2			leafy
08/26/05	2775	8	3	34	10	19	9	2	**5**	**4**		1	**5**					
08/04/06	2775	8	3	34		24	19	2	2		3							disease
08/07/07	2775	8	3						1	2	2			2	3			
08/26/05	2776	2	1	56	8	8	5	2	**5**	**3**		4	**4**					
08/04/06	2776	2	1	81		21	13	2	2		1							diseased, fine leaves
08/07/07	2776	2	1						1	3	2			2	2			
08/26/05	2776	2	2	0	8	5	3	2	**8**	**6**		0	**7**					
08/04/06	2776	2	2	33		9	9	1	3		3							small
08/07/07	2776	2	2						1	3	3			1	3			
08/26/05	2776	2	3	45	15	8	8	1	**4**	**7**		10	**5**					
08/04/06	2776	2	3	47		17	13	1	2		2							diseased, fine culms
08/07/07	2776	2	3						1	3	2			1	2			
08/26/05	2776	7	1	52	12	5	5	2	**3**	**5**		6	**3**					
08/04/06	2776	7	1	64		15	14	2	2		2							disease severe
08/07/07	2776	7	1						1	3	1			1	2			
08/26/05	2776	7	2	62	8	5	6	1	**4**	**3**		5	**4**					
08/04/06	2776	7	2	62		24	20	2	3		2							disease severe
08/07/07	2776	7	2						1	3	3			1	2			
08/26/05	2776	7	3	37	7	4	6	2	**6**	**3**		2	**6**					
08/04/06	2776	7	3	39		10	15	2	3		3							disease, small, stressed
08/07/07	2776	7	3						2	2	3			2	3			
08/26/05	2776	8	1	57	8	6	6	3	**4**	**5**		14	**4**					
08/04/06	2776	8	1	68		25	27	2	2		1							disease not severe
08/07/07	2776	8	1						1	3	1			1	1			
08/26/05	2776	8	2	DEAD														
08/26/05	2776	8	3	47	10	8	4	2	**5**	**6**		6	**5**					
08/04/06	2776	8	3	54		24	21	1	1		1							disease, yellow
08/07/07	2776	8	3						1	1	1			1	2		x	
08/26/05	2777	2	1	26	10	17	13	2	**3**	**4**		1	**4**					

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/04/06	2777	2	1	57		16	16	2	2		2							disease outer leaves
08/07/07	2777	2	1						2	3	1			1	2			
08/26/05	2777	2	2	DEAD														
08/26/05	2777	2	3	21	5	3	10	1	**4**	**2**		0	**6**					
08/04/06	2777	2	3	40		10	8	3	3		2							diseased
08/07/07	2777	2	3						1	2	2			1	3			
08/26/05	2777	6	1	DEAD														
08/26/05	2777	6	2	DEAD														
08/26/05	2777	6	3	55	12	8	9	2	**2**	**7**		14	**3**					
08/04/06	2777	6	3	75		31	20	3	2		1							disease severe
08/07/07	2777	6	3						2	3	2			2	2			
08/26/05	2777	8	1	DEAD														
08/26/05	2777	8	2	13	7	4	3	3	**5**	**2**		1	**6**					
08/04/06	2777	8	2	57		18	11	2	2		2							disease
08/07/07	2777	8	2						2	3	2			2	2			
08/26/05	2777	8	3	0	12	1	1	3	**7**	**2**		0	**7**					
08/04/06	2777	8	3	0	32	3	6	2	3		3							disease
08/07/07	2777	8	3						3	3	3			2	3			
08/26/05	2778	2	1	0	14	7	7	2	**5**	**4**		0	**6**					
08/04/06	2778	2	1	45		13	17	1	2		2							
08/07/07	2778	2	1						2	3	2			1	2			
08/26/05	2778	2	2	0	12	10	8	1	**4**	**4**		0	**4**					
08/04/06	2778	2	2	55		14	11	2	2		2							lodged
08/07/07	2778	2	2						2	3	2			2	2			
08/26/05	2778	2	3	0	4	2	3	3	**8**	**4**		0	**7**					
08/04/06	2778	2	3	34		6	6	2	2		3							diseased
08/07/07	2778	2	3						2	3	2			1	3			
08/26/05	2778	5	1	0	18	2	2	2	**7**	**3**		0	**7**					
08/04/06	2778	5	1	48		11	8	3	3		2							disease
08/07/07	2778	5	1						2	2	2			1	2			
08/26/05	2778	5	2	0	20	5	3	2	**6**	**4**		0	**6**					
08/04/06	2778	5	2	57		11	8	2	3		3							disease severe

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/07/07	2778	5	2						2	2	2			1	3			
08/26/05	2778	5	3	33	10	6	4	3	**3**	**2**		2	**5**					
08/04/06	2778	5	3	56		11	20	1	2		1							
08/07/07	2778	5	3						1	2	1			2	3			
08/26/05	2778	8	1	29	10	5	4	3	**4**	**5**		1	**5**					
08/04/06	2778	8	1	64		11	13	2	2		2							disease, severe
08/07/07	2778	8	1						1	3	2			3	2			
08/26/05	2778	8	2	DEAD														
08/26/05	2778	8	3	0	11	7	5	3	**7**	**8**		0	**8**					
08/04/06	2778	8	3	0	28	9	10	2	3		3							disease severe
08/07/07	2778	8	3						2	2	2			2	3			
08/26/05	2779	4	1	0	17	6	5	3	**4**	**2**		0	**5**					
08/04/06	2779	4	1	41		8	10	1	2		3							fine, little disease, upright
08/07/07	2779	4	1						1	1	2			1	3	x	x	very leafy, upright
08/26/05	2779	4	2	DEAD														
08/26/05	2779	4	3	DEAD														
08/26/05	2780	1	1	DEAD														
08/26/05	2780	1	2	0	10	5	3	2	**5**	**2**		0	**6**					
08/04/06	2780	1	2	0	21	12	9	2	3		3							leaf spot, yellow, no culms
08/07/07	2780	1	2						1	1	3			1	3			no heads, very small
08/26/05	2780	1	3	DEAD														
08/26/05	2780	7	1	0	20	4	4	3	**5**	**2**		0	**6**					
08/04/06	2780	7	1	0	35	9	9	2	3		3							disease, small
08/07/07	2780	7	1						3	2	3			2	3			
08/26/05	2780	7	2	0	16	1	2	3	**6**	**7**		0	**7**					
08/04/06	2780	7	2	0	32	9	8	2	3		3							disease, small
08/07/07	2780	7	2						3	2	3			1	3			
08/26/05	2780	7	3	0	20	2	2	3	**6**	**3**		0	**6**					
08/04/06	2780	7	3	0	25	6	5	2	3		3							disease, small
08/07/07	2780	7	3						3	2	3			1	3			
08/26/05	2780	10	1	DEAD														
08/26/05	2780	10	2	DEAD														

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/26/05	2780	10	3	DEAD														
08/26/05	2781	3	1	0	14	2	3	3	**5**	**2**		0	**6**					
08/04/06	2781	3	1	50		6	9	2	3		2							disease bottom leaf
08/07/07	2781	3	1						1	2	2			1	2			
08/26/05	2781	3	2	DEAD														
08/26/05	2781	3	3	31	6	5	10	2	**6**	**2**		1	**6**					
08/04/06	2781	3	3	47		13	18	2	3		1							small, small heads, bugs, stressed
08/07/07	2781	3	3						2	2	2			1	3			
08/26/05	2781	5	1	57	10	6	6	3	**3**	**2**		15	**3**					
08/04/06	2781	5	1	72		23	18	2	2		2							disease, very small
08/07/07	2781	5	1						1	2	2			2	2			
08/26/05	2781	5	2	0	5	5	5	3	**6**	**2**		0	**8**					
08/04/06	2781	5	2	18		5	5	1	3		3							
08/07/07	2781	5	2						2	2	3			1	3		x	no seed heads
08/26/05	2781	5	3	DEAD														
08/26/05	2781	10	1	DEAD														
08/26/05	2781	10	2	15	8	4	3	2	**5**	**2**		2	**5**					
08/04/06	2781	10	2	52		14	18	1	1		1							disease, upright
08/07/07	2781	10	2						1	1	1			1	2	x		
08/26/05	2781	10	3	DEAD														
08/26/05	2782	4	1	DEAD	X	X	X	X	X	X		X	X					
08/26/05	2782	4	2	0	8	1	1	3	**8**	**2**		0	**8**					
08/04/06	2782	4	2	30		6	6	2	2		2							
08/07/07	2782	4	2						1	1	2			1	3	x	x	very small plant
08/26/05	2782	4	3	DEAD														
08/26/05	2783	1	1	0	3	7	5	3	**8**	**1**		0	**8**					
08/04/06	2783	1	1	0	9	12	11	1	3		3							tiny, wrong species
08/07/07	2783	1	1						1	1	3			1	3			very small
08/26/05	2783	1	2	56	15	14	8	2	**2**	**1**		9	**2**					
08/04/06	2783	1	2	70		24	22	2	1		2							lodged
08/07/07	2783	1	2						1	3	2			3	1			insects on heads

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/26/05	2783	1	3	57	14	13	11	2	1	2		21	1					
08/04/06	2783	1	3	78		38	30	2	1		1							upright
08/07/07	2783	1	3						1	1	1			1	1			
08/26/05	2783	5	1	DEAD														
08/26/05	2783	5	2	68	8	9	6	1	6	4		7	5					
08/04/06	2783	5	2	66		32	22	3	3		2							disease, lodged
08/07/07	2783	5	2						1	2	2			2	2			
08/26/05	2783	5	3	60	12	7	8	3	2	2		4	3					
08/04/06	2783	5	3	72		21	19	2	1		2							
08/07/07	2783	5	3						1	1	2			1	2			
08/26/05	2783	10	1	42	13	8	6	3	3	4		14	3					
08/04/06	2783	10	1	76		31	30	2	1		1							diseased
08/07/07	2783	10	1						1	2	2			3	1			
08/26/05	2783	10	2	DEAD														
08/26/05	2783	10	3	DEAD														
08/26/05	2784	3	1	69	14	7	6	2	2	2		13	3					
08/04/06	2784	3	1	91		22	25	2	1		1							disease severe
08/07/07	2784	3	1						1	2	1			2	1	x		
08/26/05	2784	3	2	38	11	9	13	1	2	2		3	3					
08/04/06	2784	3	2	72		28	28	3	1		1							clean, large
08/07/07	2784	3	2						1	1	1			1	1	x		
08/26/05	2784	3	3	46	12	16	10	3	1	2		17	3					
08/04/06	2784	3	3	68		29	26	1	1		1							fine, upright
08/07/07	2784	3	3						1	1	1			1	2	x		very fine leaves, clean
08/26/05	2784	7	1	67	12	7	6	2	3	4		11	3					
08/04/06	2784	7	1	69		27	21	3	1		1							
08/07/07	2784	7	1						1	1	1			1	1	x		
08/26/05	2784	7	2	62	12	10	20	3	4	6		7	3					
08/04/06	2784	7	2	72		19	24	2	2		1							
08/07/07	2784	7	2						1	1	1			1	1	x		
08/26/05	2784	7	3	67	12	18	11	2	3	6		5	3					

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/04/06	2784	7	3	88		25	20	2	1		2							stressed, yellow
08/07/07	2784	7	3						1	1	1			1	1	x		
08/26/05	2784	10	1	DEAD														
08/26/05	2784	10	2	DEAD														
08/26/05	2784	10	3	42	18	6	12	2	**2**	**2**		6	**2**					
08/04/06	2784	10	3	77		21	28	2	1		1							disease severe
08/07/07	2784	10	3						1	3	1			3	1			
08/26/05	2786	4	1	67	12	5	4	1	**4**	**3**		8	**4**					
08/04/06	2786	4	1	86		20	21	3	2		1							large plant
08/07/07	2786	4	1						1	1	2			3	2			
08/26/05	2786	4	2	60	14	5	6	2	**3**	**3**		4	**4**					
08/04/06	2786	4	2	67		21	17	1	2		2							diseased, lodged
08/07/07	2786	4	2						2	2	3			3	3			
08/26/05	2786	4	3	92	18	12	6	1	**2**	**2**		22	**2**					
08/04/06	2786	4	3	91		29	31	3	1		1							large, coarse
08/07/07	2786	4	3						1	2	1			3	1			
08/26/05	2786	11	1a	71	17	12	9	1	**2**	**5**		11	**2**					
08/04/06	2786	11	1a	97		30	39	3	2		1							
08/07/07	2786	11	1a						2	2	2			3	1			
08/26/05	2786	11	2a	32	18	4	4	2	**4**	**3**		2	**4**					
08/04/06	2786	11	2a	79		14	16	3	2		2							lodged
08/07/07	2786	11	2a						1	2	2			3	2			
08/26/05	2786	11	1b	64	15	7	10	1	**3**	**4**		13	**2**					
08/04/06	2786	11	1b	81		39	28	2	1		1							
08/07/07	2786	11	1b															
08/26/05	2787	4	1	57	11	8	7	2	**3**	**3**		8	**3**					
08/04/06	2787	4	1	68		24	24	2	2		1							
08/07/07	2787	4	1						1	1	2			1	2	x		coarse leaves
08/26/05	2787	4	2	59	19	9	9	2	**5**	**3**		6	**4**					
08/04/06	2787	4	2	57		30	27	2	2		2							center dead
08/07/07	2787	4	2						1	1	2			2	2	x		
08/26/05	2787	4	3	DEAD														

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/26/05	2787	11	1a	DEAD														
08/26/05	2787	11	1b	DEAD														
08/26/05	2788	1	1	0	10	6	7	2	**6**	**1**		0	**5**					
08/04/06	2788	1	1	41		15	15	2	3		3							disease, lodged
08/07/07	2788	1	1						2	1	2			1	3			very coarse leaves
08/26/05	2788	1	2	0	10	1	8	2	**8**	**7**		0	**7**					
08/04/06	2788	1	2	0	14	9	12	2	3		3							small, stressed, yellow, diseased
08/07/07	2788	1	2						2	2	3			1	3			
08/26/05	2788	1	3	0	6	1	1	3	**8**	**2**		0	**7**					
08/04/06	2788	1	3	18		3	6	2	3		3							very small, stressed
08/07/07	2788	1	3						2	1	3			1	3			
08/26/05	2788	7	1	DEAD														
08/26/05	2788	7	2	DEAD														
08/26/05	2788	7	3	38	8	6	19	2	**5**	**4**		1	**5**					
08/04/06	2788	7	3	56		20	21	2	3		3							disease, short, sprawling
08/07/07	2788	7	3						2	2	2			2	3			
08/26/05	2788	10	1	DEAD														
08/26/05	2788	10	2	34	18	7	8	2	**3**	**2**		3	**4**					
08/04/06	2788	10	2	69		24	27	3	2		1							short, wide
08/07/07	2788	10	2						1	1	1			2	1	x		
08/26/05	2788	10	3	DEAD														
08/26/05	2789	3	1	56	12	4	6	3	**4**	**7**		12	**5**					
08/04/06	2789	3	1	69		12	17	2	3		3							diseased, lodged
08/07/07	2789	3	1						3	3	3			2	3			
08/26/05	2789	3	2	DEAD														
08/26/05	2789	3	3	31	9	8	6	3	**5**	**6**		2	**5**					
08/04/06	2789	3	3	54		21	23	2	3		2							diseased
08/07/07	2789	3	3						3	2	2			2	3			
08/26/05	2789	6	1	DEAD														
08/26/05	2789	6	2	DEAD														
08/26/05	2789	6	3	DEAD														
08/26/05	2789	9	1	30	10	4	3	3	**6**	**2**		3	**6**					

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/04/06	2789	9	1	48		10	12	2	3		3							diseased
08/07/07	2789	9	1						2	2	2			2	2			
08/26/05	2789	9	2	DEAD														
08/26/05	2789	9	3	48	13	6	4	2	**5**	**7**		4	**5**					
08/04/06	2789	9	3	57		17	14	2	3		2							stressed
08/07/07	2789	9	3						2	2	2			2	2			
08/26/05	2790	4	1	DEAD														
08/26/05	2790	4	2	0	6	1	1	2	**8**	**2**		0	**8**					
08/04/06	2790	4	2	27		4	3	2	3		3							almost dead, lodged
08/07/07	2790	4	2						3	2	3			2	3			small
08/26/05	2790	4	3	36	8	2	2	3	**6**	**2**		1	**6**					
08/04/06	2790	4	3	37		11	14	1	3		3							
08/07/07	2790	4	3						2	2	2			1	3			
08/26/05	2790	11	1	37	9	7	5	2	**6**	**3**		4	**6**					
08/04/06	2790	11	1	45		16	17	2	3		3							diseased, stressed
08/07/07	2790	11	1						2	2	2			2	3			
08/26/05	2792	1	1	70	18	14	6	1	**4**	**3**		8	**3**					
08/04/06	2792	1	1	75		2	17	2	2		1							very upright
08/07/07	2792	1	1						1	1	1			1	1			very upright
08/26/05	2792	1	2	0	30	7	13	2	**5**	**3**		0	**4**					
08/04/06	2792	1	2	52		17	19	2	3		3							lodged, boot stage
08/07/07	2792	1	2						3	1	2			1	2			late maturing (boot)
08/26/05	2792	1	3	59	16	7	6	2	**2**	**6**		9	**2**					
08/04/06	2792	1	3	60		24	27	2	2		2							late boot
08/07/07	2792	1	3						1	1	1			1	2			coarse leaves
08/26/05	2792	5	1	0	23	2	2	2	**6**	**2**		0	**5**					
08/04/06	2792	5	1	43		13	6	2	3		3							small
08/07/07	2792	5	1						2	1	2			1	2			
08/26/05	2792	5	2	54	9	9	6	3	**3**	**2**		2	**4**					
08/04/06	2792	5	2	45		26	27	2	2		3							open, not leafy
08/07/07	2792	5	2						1	1	2			1	2			
08/26/05	2792	5	3	40	12	4	5	3	**2**	**2**		2	**3**					

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/04/06	2792	5	3	61		26	26	2	2		3							
08/07/07	2792	5	3						1	2	2			1	2			
08/26/05	2792	9	1	56	15	4	7	2	**4**	**2**		6	**4**					
08/04/06	2792	9	1	73		27	29	3	2		1							blue, no center
08/07/07	2792	9	1						2	1	2			2	2			
08/26/05	2792	9	2	35	19	4	3	3	**4**	**2**		7	**4**					
08/04/06	2792	9	2	65		24	25	2	3		2							blue, no center
08/07/07	2792	9	2						2	1	2			2	2			
08/26/05	2792	9	3	60	16	9	4	1	**4**	**2**		6	**3**					
08/04/06	2792	9	3	77		26	24	3	3		2							blue, no center
08/07/07	2792	9	3						2	1	2			2	2			
08/26/05	2793	3	1	68	15	12	5	2	**2**	**2**		5	**2**					
08/04/06	2793	3	1	85		22	17	3	1		1							disease, lodging, coarse
08/07/07	2793	3	1						1	1	1			2	1	x		very coarse leaves, tall
08/26/05	2793	3	2	37	10	4	5	3	**4**	**3**		1	**5**					
08/04/06	2793	3	2	76		18	12	1	2		2							
08/07/07	2793	3	2						2	2	2			2	2			
08/26/05	2793	3	3	37	12	3	6	2	**5**	**2**		3	**5**					
08/04/06	2793	3	3	57		18	22	2	2		1							blue, upright, clean
08/07/07	2793	3	3						1	1	2			1	2	x		
08/26/05	2793	6	1	0	20	9	9	2	**2**	**3**		0	**3**					
08/04/06	2793	6	1	60		20	25	2	1		1							disease
08/07/07	2793	6	1						1	2	2			2	2			
08/26/05	2793	6	2	0	12	6	2	2	**6**	**2**		0	**6**					
08/04/06	2793	6	2	52		9	15	2	2		3							
08/07/07	2793	6	2						1	1	2			1	1			
08/26/05	2793	6	3	63	12	25	18	3	**2**	**2**		6	**3**					
08/04/06	2793	6	3	68		31	22	1	1		1							leafy, yellow
08/07/07	2793	6	3						1	1	2			2	1			
08/26/05	2793	9	1	DEAD														
08/26/05	2793	9	2	DEAD														
08/26/05	2793	9	3	57	14	10	10	3	**2**	**2**		15	**2**					

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/04/06	2793	9	3	73		28	14	2	1		1							leafy
08/07/07	2793	9	3						1	2	1			3	1			
08/26/05	2794	1	1	59	15	13	11	2	**1**	**6**		27	**1**					
08/04/06	2794	1	1	68		28	29	2	1		1							very leafy
08/07/07	2794	1	1						1	2	1			3	1			very leafy
08/26/05	2794	1	2	65	20	2	4	2	**6**	**7**		5	**6**					
08/04/06	2794	1	2	87		18	18	2	3		3							disease, dead center
08/07/07	2794	1	2						2	1	2			1	3			
08/26/05	2794	1	3	76	22	10	8	1	**3**	**7**		12	**3**					
08/04/06	2794	1	3	84		24	21	2	2		2							disease, lodged
08/07/07	2794	1	3						1	2	1			3	2			
08/26/05	2794	7	1	65	12	14	14	2	**3**	**3**		14	**3**					
08/04/06	2794	7	1	82		36	36	2	1		1							leafy, coarse
08/07/07	2794	7	1						1	2	2			2	1			
08/26/05	2794	7	2	76	11	4	5	1	**4**	**2**		7	**4**					
08/04/06	2794	7	2	76		36	24	2	1		1							
08/07/07	2794	7	2						1	2	2			1	1			
08/26/05	2794	7	3	67	12	14	8	2	**2**	**2**		20	**2**					
08/04/06	2794	7	3	80		24	25	2	1		1							disease, lodged
08/07/07	2794	7	3						1	3	2			3	1			
08/26/05	2794	9	1	DEAD														
08/26/05	2794	9	2	59	17	11	9	3	**2**	**3**		14	**2**					
08/04/06	2794	9	2	78		30	36	2	1		1							leafy, robust, slight disease
08/07/07	2794	9	2						1	2	1			3	1			
08/26/05	2794	9	3	DEAD														
08/26/05	2813	3	1	68	15	8	5	1	**4**	**6**		8	**3**					
08/04/06	2813	3	1	69		32	22	3	3		2							disease
08/07/07	2813	3	1						1	3	2			2	2			
08/26/05	2813	3	2	54	9	7	6	3	**3**	**6**		6	**4**					
08/04/06	2813	3	2	73		21	22	1	2		2							disease, lodging
08/07/07	2813	3	2						1	3	2			2	2			
08/26/05	2813	3	3	DEAD														

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/26/05	2813	6	1	0	13	6	4	3	3	2		0	4					
08/04/06	2813	6	1	36		12	10	1	1		2							disease, yellow, stress
08/07/07	2813	6	1						1	3	2			2	3			
08/26/05	2813	6	2	DEAD														
08/26/05	2813	6	3	DEAD														
08/26/05	2813	9	1	38	16	6	4	3	3	2		10	3					
08/04/06	2813	9	1	64		18	21	2	3		1							lodged
08/07/07	2813	9	1						1	3	2			3	2			
08/26/05	2813	9	2	DEAD														
08/26/05	2813	9	3	DEAD														
08/26/05	2814	1	1	72	20	10	9	3	2	4		16	3					
08/04/06	2814	1	1	79		22	36	1	2		2							stressed
08/07/07	2814	1	1						3	2	1			3	2			
08/26/05	2814	1	2	84	26	21	14	3	2	2		9	2					
08/04/06	2814	1	2	92		21	30	2	2		2							yellowed
08/07/07	2814	1	2						2	2	2			3	2			
08/26/05	2814	1	3	38	12	6	6	3	4	1		2	4					
08/04/06	2814	1	3	66		14	18	1	2		2							dead center
08/07/07	2814	1	3						2	1	2			2	2			
08/26/05	2814	5	1	51	11	5	8	2	3	7		7	5					
08/04/06	2814	5	1	58		21	18	2	3		2							stressed, yellow
08/07/07	2814	5	1						1	1	2			1	3			very fine leaves
08/26/05	2814	5	2	68	14	2	4	2	5	6		2	5					
08/04/06	2814	5	2	72		24	24	2	3		2							lodged, disease
08/07/07	2814	5	2						2	1	2			3	2			
08/26/05	2814	5	3	73	13	5	9	3	2	2		17	3					
08/04/06	2814	5	3	77		29	23	1	2		1							fine leaves
08/07/07	2814	5	3						1	1	2			3	1			
08/26/05	2814	9	1	DEAD														
08/26/05	2814	9	2	47	16	12	8	2	4	3		2	4					
08/04/06	2814	9	2	54		19	13	2	2		2							
08/07/07	2814	9	2						2	1	1			2	2	x		blue

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/26/05	2814	9	3	10	12	6	2	3	**6**	**4**		0	**7**					
08/04/06	2814	9	3	42		12	8	1	3		3							very fine leaf small
08/07/07	2814	9	3						2	2	2			2	3			
08/26/05	2815	3	1	DEAD														
08/26/05	2815	3	2	DEAD														
08/26/05	2815	3	3	42	5	3	3	3	**6**	**2**		3	**5**					
08/04/06	2815	3	3	49		15	13	1	2		2							clean
08/07/07	2815	3	3						1	1	2			1	2			leafy, fine leaves
08/26/05	2815	6	1	0	20	9	3	3	**5**	**4**		0	**5**					
08/04/06	2815	6	1	45		15	13	2	1		3							blue, leafy
08/07/07	2815	6	1						1	1	2			1	2	x		
08/26/05	2815	6	2	DEAD														
08/26/05	2815	6	3	86	9	4	4	2	**4**	**2**		5	**3**					
08/04/06	2815	6	3	80		21	19	2	2		2							leafy
08/07/07	2815	6	3						1	1	2			3	2			
08/26/05	2815	9	1	DEAD														
08/26/05	2815	9	2	54	16	5	9	3	**5**	**3**		3	**5**					
08/04/06	2815	9	2	83		20	17	2	3		2							blue, disease
08/07/07	2815	9	2						1	1	2			2	1			
08/26/05	2815	9	3	48	15	9	7	2	**2**	**2**		3	**3**					
08/04/06	2815	9	3	51		22	20	2	1		2							blue, leafy
08/07/07	2815	9	3						1	2	2			2	2			
08/26/05	2816	4	1	DEAD														
08/26/05	2816	4	2	DEAD														
08/26/05	2816	4	3	48	10	12	10	1	**4**	**3**		7	**3**					
08/04/06	2816	4	3	63		26	23	2	1		1							very leafy, some disease, blue, short
08/07/07	2816	4	3						1	3	2			1	2			
08/26/05	2816	11	1a	36	13	9	9	1	**4**	**9**		3	**6**					
08/04/06	2816	11	1a	45		22	24	2	1		2							
08/07/07	2816	11	1a						1	3	2			2	2			
08/26/05	2816	11	2a	DEAD														

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/26/05	2816	11	1b	32	9	6	4	2	**5**	**3**		1	**5**					
08/04/06	2816	11	1b	45		18	20	2	2		1							
08/07/07	2816	11	1b															
08/26/05	2816	11	2b	DEAD														
08/26/05	2817	2	1	DEAD														
08/26/05	2817	2	2	DEAD														
08/26/05	2817	2	3	DEAD														
08/26/05	2817	7	1	DEAD														
08/26/05	2817	7	2	DEAD														
08/26/05	2817	7	3	0	10	3	3	3	**7**	**4**		0	**7**					
08/04/06	2817	7	3	0	23	7	12	2	3		3							disease, small plant
08/07/07	2817	7	3						3	2	3			2	3			
08/26/05	2817	9	1	DEAD														
08/26/05	2817	9	2	DEAD														
08/26/05	2817	9	3	DEAD														
08/26/05	2818	3	1	DEAD														
08/26/05	2818	3	2	DEAD														
08/26/05	2818	3	3	DEAD														
08/26/05	2818	6	1	29	6	3	4	3	**6**	**2**		1	**7**					
08/04/06	2818	6	1	54		9	6	2	3		3							disease
08/07/07	2818	6	1						3	2	2			1	3			
08/26/05	2818	6	2	46	9	10	7	2	**4**	**5**		8	**4**					
08/04/06	2818	6	2	52		23	17	2	2		1							leafy
08/07/07	2818	6	2						1	1	1			1	2	x		
08/26/05	2818	6	3	0	18	1	2	3	**6**	**6**		0	**8**					
08/04/06	2818	6	3	29		5	7	2	3		3							disease, almost dead
08/07/07	2818	6	3	DEAD														
08/26/05	2818	9	1	0	12	7	4	2	**6**	**4**		0	**6**					
08/04/06	2818	9	1	0	24	12	11	2	3		3							disease
08/07/07	2818	9	1						1	2	2			2	3			
08/26/05	2818	9	2	16	12	6	3	2	**6**	**5**		2	**6**					
08/04/06	2818	9	2	34		10	17	2	3		3							disease

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/07/07	2818	9	2						2	2	2			3	3			
08/26/05	2818	9	3	DEAD														
08/26/05	2820	1	1	26	7	8	5	2	**7**	**2**		1	**7**					
08/04/06	2820	1	1	51		12	15	2	3		3							stressed
08/07/07	2820	1	1						3	1	3			1	3			
08/26/05	2820	1	2	48	26	7	11	2	**3**	**2**		4	**3**					
08/04/06	2820	1	2	60		15	20	2	2		3							stressed, lodged
08/07/07	2820	1	2						2	1	3			2	2			
08/26/05	2820	1	3	DEAD														
08/26/05	2820	7	1	0	20	2	3	3	**7**	**3**		0	**8**					
08/04/06	2820	7	1	0	24	4	8	1	3		3							disease, small
08/07/07	2820	7	1						3	2	3			2	3			
08/26/05	2820	7	2	0	10	1	1	3	**8**	**2**	0	0	**8**					
08/04/06	2820	7	2	DEAD														
08/26/05	2820	7	3	DEAD														
08/26/05	2820	11	1	0	10	3	4	2	**5**	**3**		0	**7**					
08/04/06	2820	11	1	44		13	15	2	3		3							disease, stressed
08/07/07	2820	11	1						3	2	3			3	3			
08/26/05	2820	11	2	DEAD														
08/26/05	2820	11	3	DEAD														
08/26/05	2821	3	1	DEAD														
08/26/05	2821	3	2	DEAD														
08/26/05	2821	3	3	DEAD														
08/26/05	2821	5	1	0	18	7	3	3	**5**	**2**		0	**6**					
08/04/06	2821	5	1	29		15	9	2	2		3							no heads, stress
08/07/07	2821	5	1						1	1	3			2	3			small
08/26/05	2821	5	2	DEAD														
08/26/05	2821	5	3	DEAD														
08/26/05	2821	10	1	DEAD														
08/26/05	2821	10	2	DEAD														
08/26/05	2821	10	3	DEAD														
08/26/05	2822	4	1	DEAD														

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/26/05	2822	4	2	0	15	2	2	2	**5**	**2**		0	**5**					
08/04/06	2822	4	2	48		11	9	2	2		3							lodged, stress, no disease
08/07/07	2822	4	2						2	2	3			2	3			
08/26/05	2822	4	3	0	10	4	4	2	**5**	**2**		0	**5**					
08/04/06	2822	4	3	67		9	8	3	2		3							lodged, stressed
08/07/07	2822	4	3						2	1	2			3	3			
08/26/05	2822	11	1	DEAD														
08/26/05	2822	11	2	DEAD														
08/26/05	2822	11	3	0	20	4	8	1	**4**	**2**		0	**5**					
08/04/06	2822	11	3	88		14	17	3	2		2							slight lodging
08/07/07	2822	11	3						2	2	2			2	2			
08/26/05	2823	4	1	0	29	6	4	2	**5**	**3**		0	**5**					
08/04/06	2823	4	1	48		9	5	2	3		3							small plant
08/07/07	2823	4	1						3	1	2			2	3			
08/26/05	2823	4	2	0	17	2	2	3	**5**	**3**		0	**6**					
08/04/06	2823	4	2	40		6	4	2	2		3							small, stressed, disease
08/07/07	2823	4	2						3	1	2			2	3			
08/26/05	2823	4	3	DEAD														
08/26/05	2823	11	1	0	10	2	2	3	**8**	**2**		0	**8**					
08/04/06	2823	11	1	0	15	3	4	2	3		3							small
08/07/07	2823	11	1						2	1	2			1	3			
08/26/05	2823	11	2	DEAD														
08/26/05	2825	1	1	25	15	3	6	2	**4**	**1**		1	**4**					
08/04/06	2825	1	1	69		15	12	2	3		2							
08/07/07	2825	1	1						1	1	1			1	2			
08/26/05	2825	1	2	0	9	1	7	2	**7**	**1**		0	**8**					
08/04/06	2825	1	2	41		7	12	2	3		3							
08/07/07	2825	1	2						3	2	2			1	3			
08/26/05	2825	1	3	70	12	8	11	1	**5**	**1**		5	**4**					
08/04/06	2825	1	3	69		15	24	3	3		3							not leafy, sprawling
08/07/07	2825	1	3						2	2	2			1	2			Insects in heads, coarse
08/26/05	2825	5	1	DEAD														

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/26/05	2825	5	2	DEAD														
08/26/05	2825	5	3	48	10	18	13	1	6	4		2	5					
08/04/06	2825	5	3	79		25	23	3	3		2							disease not severe
08/07/07	2825	5	3						3	3	2			1	2			coarse leaves
08/26/05	2825	10	1	DEAD														
08/26/05	2825	10	2	0	10	4	4	3	5	2		0	5					
08/04/06	2825	10	2	42		16	14	2	2		1							
08/07/07	2825	10	2						1	1	3			2	2			
08/26/05	2825	10	3	DEAD														
08/26/05	2826	3	1	52	8	6	6	2	5	2		1	4					
08/04/06	2826	3	1	78		19	17	2	2		1							
08/07/07	2826	3	1						1	1	2			1	1	x		
08/26/05	2826	3	2	67	11	12	15	1	3	4		5	3					
08/04/06	2826	3	2	70		21	33	2	1		1							leafy, clean
08/07/07	2826	3	2						1	1	1			1	1	x		very leafy
08/26/05	2826	3	3	47	11	16	17	3	4	1		7	4					
08/04/06	2826	3	3	63		19	23	1	1		1							fine leaf, yellow, disease
08/07/07	2826	3	3						1	2	2			1	3			
08/26/05	2826	7	1	57	12	7	13	3	3	2		9	3					
08/04/06	2826	7	1	67		14	19	2	2		2							
08/07/07	2826	7	1						1	1	2			2	1	x		
08/26/05	2826	7	2	34	8	6	20	3	5	4		2	5					
08/04/06	2826	7	2	60		14	19	2	1		1							fine leafed
08/07/07	2826	7	2						1	1	2			2	1	x		
08/26/05	2826	7	3	61	12	9	7	3	3	2		4	3					
08/04/06	2826	7	3	66		18	16	2	1		1							fine leafed, slight disease
08/07/07	2826	7	3						1	1	1			2	1	x		
08/26/05	2826	10	1	DEAD														
08/26/05	2826	10	2	DEAD														
08/26/05	2826	10	3	48	13	11	11	3	3	2		12	4					
08/04/06	2826	10	3	77		30	30	1	1		1							disease, leafy
08/07/07	2826	10	3						1	1	1			2	1	x		

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/26/05	Goshen	4	1	DEAD														
08/26/05	Goshen	4	2	0	20	4	6	1	**3**	**4**		0	**4**					
08/04/06	Goshen	4	2	67		21	21	2	2		2							leafy
08/07/07	Goshen	4	2						1	3	2			2	2			
08/26/05	Goshen	4	3	57	14	9	9	1	**3**	**4**		7	**3**					
08/04/06	Goshen	4	3	82		22	23	2	1		1							some disease, leafy
08/07/07	Goshen	4	3						1	2	1			2	1	x		
08/26/05	Goshen	8	1	54	7	6	4	2	**5**	**7**		5	**5**					
08/04/06	Goshen	8	1	60		22	22	2	2		2							disease, no center
08/07/07	Goshen	8	1						1	3	2			3	1			
08/26/05	Goshen	8	2	56	8	13	5	2	**3**	**7**		8	**3**					
08/04/06	Goshen	8	2	56		24	19	3	2		2							disease severe
08/07/07	Goshen	8	2						1	3	2			3	2			
08/26/05	Goshen	8	3	55	6	12	17	2	**5**	**7**		3	**6**					
08/04/06	Goshen	8	3	63		29	28	2	1		1							disease severe
08/07/07	Goshen	8	3						1	2	1			1	1	x		
08/26/05	Goshen	10	1	35	10	6	5	2	**5**	**2**		7	**4**					
08/04/06	Goshen	10	1	81		30	30	2	2		1							
08/07/07	Goshen	10	1						1	3	2			3	1			
08/26/05	Goshen	10	2	50	13	17	11	2	**2**	**3**		16	**2**					
08/04/06	Goshen	10	2	52		24	33	2	1		1							leafy
08/07/07	Goshen	10	2						1	3	2			3	1			
08/26/05	Goshen	10	3	67	16	13	4	1	**4**	**3**		8	**4**					
08/04/06	Goshen	10	3	89		31	36	3	2		1							
08/07/07	Goshen	10	3						1	3	2			3	1			
08/26/05	ND95	1	1	60	12	23	18	1	**4**	**3**		15	**3**					
08/04/06	ND95	1	1	73		36	39	3	2		1							
08/07/07	ND95	1	1						2	2	2			1	1			
08/26/05	ND95	1	2	20	12	5	4	3	**6**	**2**		1	**5**					
08/04/06	ND95	1	2	66		9	15	2	3		3							some
08/07/07	ND95	1	2						2	2	3			1	2			
08/26/05	ND95	1	3	25	12	10	9	2	**4**	**3**		1	**4**					

Date	908 Accn*	Row	Plant no.	Culm ht. (in.)	Veg. ht. (in.)	EW spread (in.)	NS spread (in.)	Leaf width rating	Leaf-iness rating	Di-sease rating	Seed culms rating	No. of culms	Vigor rating	Lodg-ing rating	Size rating	** sel	*** lsp sel	Comments
08/04/06	ND95	1	3	69		15	18	2	2		2							rust on leaves
08/07/07	ND95	1	3						1	2	1			2	1			
08/26/05	ND95	5	1	36	10	10	11	2	**3**	**5**		1	**4**					
08/04/06	ND95	5	1	78		17	20	2	2		2							disease severe
08/07/07	ND95	5	1						1	3	2			3	2			
08/26/05	ND95	5	2	29	11	6	5	3	**3**	**8**		4	**4**					
08/04/06	ND95	5	2	55		24	25	1	1		2							disease severe
08/07/07	ND95	5	2						1	3	2			3	2			
08/26/05	ND95	5	3	54	9	7	6	3	**3**	**6**		19	**3**					
08/04/06	ND95	5	3	71		19	20	2	2		2							disease severe
08/07/07	ND95	5	3						1	3	2			3	2			
08/26/05	ND95	11	1	DEAD														
08/26/05	ND95	11	2	DEAD														
08/26/05	ND95	11	3	DEAD														

ACTIVE STUDIES: TECHNICAL REPORT 2007

Study: NDPMC-P-0402-RA

Study Title: Sand Bluestem Seed Increase (*Andropogon hallii*)

Introduction: Plant species available for stabilizing sandy soils are limited. Sand bluestem is a tall, warm-season, perennial grass, native on sandy sites in the Great Plains. Its growth habit and forage quality are important attributes when used in conservation plantings.

Objective: The purpose of this study is to develop a sand bluestem release from native collections from SouthDakota, North Dakota, and Minnesota. Superior plants will be selected and the release would be for various conservation plantings on sandy sites in South Dakota, North Dakota, and Minnesota.

Cooperators: USDA, NRCS, Bismarck Plant Materials Center

Description: Sand bluestem is a tall, perennial, warm season grass that can grow to a height of 7 feet. It has short rhizomes. The culms are solid. The seed heads are racemes forming the "turkey foot" shape and closely resembling big bluestem. It is distinquished from big bluestem by its lack of hairs on the leaves and the dense yellow hairs on the seed heads. The stems tend to be straw-colored. It is not as palatable as big bluestem but does provide excellent grazing and decreases with grazing pressure.

Distribution: Sandy soils of the Great Plains

Methods and Materials

Collection: Seed was hand harvested from various sites throughout North Dakota, South Dakota, and Minnesota in the fall of 2004 Each collection was accessioned (assigned an ID number). See Table SB-1 for a list of collection information.

Assembly: Seed was planted to cone-tainers in the greenhouse in February of 2005. Seedlings were hardened off in the lath house and planted to a field in Panel A at the PMC in May 2005.

Planting Plan: See Figure SB-1 for a planting plan. The planting was made on 5/24/2005. Accessions were planted in three-plant plots, with accessions random within a replication. Three replications were planted. The third replication does not have all three plants for all accessions, due to limited germination of seed in the greenhouse. Plants were spaced 42 inches apart within the row and rows were 42 inches apart.

Site Preparation: The site was prepared by tilling and slightly packing prior to planting. The site was black fallowed at least 2 years before planting.

Planting Method: The plants were hand-planted. Holes were dug using specially made dibble bars that produced holes approximately the length of the long roots growing in the cone-tainers.

Planting Date: 5/24/2005

Maintenance:

2005	Fertilizer - none
2005	Weed control - frequent shallow tilling using walk behind front tine garden tiller
2005	Irrigation - once right after planting to establish plants
2005	Residue removal-hand clipped to 3 inch stubble in November
2006	Fertilizer - none

2006	Weed control - shallow tilling, hand hoeing
2006	Irrigation - once in July during severe drought
2006	Residue removal-attempted to burn,hand clipped in November
2007	Weed control-shallow tilling, hand hoeing
2007	Fertilizer - none

Data Collection: Data was collected for each plant in the field in 2005, 2006, and 2007. See Table SB-2 for data.

Results and Discussion

Survival of transplants was good. Plant vigor overall was good in 2005 and 2006 despite the droughty conditions. Vigor was excellent in 2007. Plant color ranges from blue green to green. Plants within some accessions have different growth habits. This is expected for seed collected accessions as parentage could be different. Some accessions appear to be big bluestem or a cross rather than sand bluestem. All plants that are not *Andropogon hallii* will be removed in 2008. Data tables indicate these accessions. Preliminary selections of superior plants were made based on visual observations in 2007. These are also indicated in the data table. Additional data for each plant will be collected in 2008. Flowering dates for plants will be recorded in 2008. Data collected from all years will be analyzed before making final selections for a crossing block (breeder) planned for 2009 or 2010.

Table SB-1. Sand bluestem collection information					
Accession	**State**	**County**	**Date**	**Legal Description**	**Collector**
9082894	SD	Harding	09/14/03	Sec.30, T15N, R5E SE of N Crow Butte	L.Smith
9082803	ND	Adams	09/02/03	SW1/4 Sec.11 and NE1/4 of Sec.14, T129N, R92W Roadway	J.Klein, J.Timm
9082804	ND	Ransom	09/08/03	Sec. 14 and Sec.23, T135N, R53W Sheyenne Grasslands	
9082805	ND	McHenry	09/24/03	Sec.20, T158N, R75W, Mouse River State Forest	M.Knudson
9082806	ND	McHenry	09/24/03	Sec.13, T153N, R76W road ditch SE of George Lake	M.Knudson
9082807	SD	Corson	09/23/03	Sec.29, T20N, R18E flat area	D.Evenson
9082808	ND	Ransom	09/09/03	Sec.27,34 T135N, R53W 2mi N of Hwy 27 along 147 Ave. N	
9082809	SD	Brown	09/09/03	NE1/4 26, SW1/4 25, T128N, R60W 1mi from Brown/Marshall Co. line	
9082810	SD	Todd	09/19/03	SW1/4 19, T36N, R29W N of county road	L.Schoon
9082811	SD	Todd	09/19/03	NW1/4 Sec.25, T36N, R31W, 3/4mi W Hwy S of St. Francis	L.Schoon
9082812	SD	Todd	09/19/03	SE1/4 Sec.9, T36N, R28W 1/2 mi W of Hwy 83, N edge of county road	L.Schoon
9082824	ND	Billings	10/01/03	SW1/4 Sec.22, T139N, R103W along Little Missouri River	M.Humann
9082827	ND	McHenry	09/15/03	NW1/4 Sec.2, T75N, R154W east of farm	W.Duckwitz
9082881	MT		2003	Sec.25, T11N, R48E	T.Haughain, Kilian
9082904	ND	Burleigh	09/09/03	Sec.7, T137N, R77W Moffit Rd west of curve	Jensen, Bergsagel
9082905	ND	Emmons	09/23/04	4 mi S. of Glencoe Church, Hwy 1804, east side of road	D.Tober
Garden	KS			Received from Manhattan, KS PMC	
sher1	MN	Sherburne	09/04/03	Sec.27, T34N, R27W Sand Dunes State Forest, east exposure	G.Hugo
sher2	MN	Sherburne	09/04/03	Sec.4, T133N, R28W non-cropped pivot corner	B.Gullickson
sher3	MN	Sherburne	09/04/03	SESE Sec.15, T34N, R27W old Christmas tree plantation	G.Hugo
sher4	MN	Sherburne	09/04/03	Sec.24, T34N, R29W Oak Savannah Land preserve (county park)	B.Gullickson
sher5	MN	Sherburne	09/04/03	Sec.16, T34N, R29W & Sec.31, T34, R28 along railroad tracks	B.Gullickson

Figure SB-1. Plot Layout of Sand Bluestem Assembly.

Location: Panel A
Planting Date: 5/24/2005
(Plants were started in conetainers in the greenhouse from collected seed)

Plant spacing: 42 inches (3.5 ft.)
Row spacing: 42 inches (3.5 ft.)

Garden	9082811	9082809	9082806	sher5	9082881
Garden	9082811	9082809	9082806	sher5	9082881
Garden	9082811	9082809	9082806	sher5	9082881
9082827	9082905	9082881	9082807	9082806	sher3
9082827	9082905	9082881	9082807	9082806	sher3
9082827	9082905	9082881	9082807	9082806	sher3
9082810	sher5	9082811	sher3	9082812	9082810
9082810	sher5	9082811	sher3	9082812	9082810
9082810	sher5	9082811	sher3	9082812	9082810
9082809	9082807	sher5	9082810	9082804	Garden
9082809	9082807	sher5	9082810	9082804	Garden
9082809	9082807	sher5	9082810	9082804	Garden
9082806	9082904	9082804	9082812	9082809	9082803
9082806	9082904	9082804	9082812	9082809	9082803
9082806	9082904	9082804	9082812	9082809	9082803
9082803	sher3	Garden	sher2	9082811	9082905
9082803	sher3	Garden	sher2	9082811	9082905
9082803	sher3	Garden	sher2	9082811	9082905
9082808	sher2	9082803	9082904	sher2	9082904
9082808	sher2	9082803	9082904	sher2	9082904
9082808	sher2	9082803	9082904	sher2	9082904
9082881	9082804	9082905	9082808	9082808	9082807
9082881	9082804	9082905	9082808	9082808	9082807
9082881	9082804	9082905	9082808	9082808	9082807
9082812	9082894	9082827	blank	9082827	9082824
9082812	9082894	9082827	blank	9082827	sher4
9082812	9082894	9082827	blank	9082827	sher1

Table SB-2. Sand Bluestem *Andropogon gerardii* evaluation; 2005, 2006, and 2007 data.

Key: Canopy spread = width of plant
Culm height = height of plant including seed culm

Ratings

Leaf width: 1=fine, narrow; 2=medium; 3=wide
Leafiness: 1=many leaves; 2=medium; 3=few leaves
Seed heads: 1=many; 2=medium; 3=very few or none; y=yes; n=no
Lodging: 1=none, slight; 2=medium; 3=severe
Overall size: 1=large; 2=medium; 3=small
Selected: x=selected for forage; L=selected for landscaping

Date	Accession	Row	Plant No.	Canopy spread (inches)	Culm height (inches)	Leaf width rating	Leafiness rating	Seed heads rating	Lodging rating	Overall size rating	Selected	Comments
9/13/2005	9082894	2	1					y				
8/4/2006	9082894	2	1	18	48	2	1	1				lime green
8/7/2007	9082894	2	1				1	1	1	1	xL	yellow-green
9/13/2005	9082894	2	2					y				
8/4/2006	9082894	2	2	7	21	2	3	2				yellow-green
8/7/2007	9082894	2	2				2	2	1	3		
9/13/2005	9082894	2	3					y				
8/4/2006	9082894	2	3	13	51	2	2	1				
8/7/2007	9082894	2	3				2	1	1	2	xL	powder blue, white heads
9/13/2005	9082803	1	1	DEAD								
9/13/2005	9082803	1	2					y				
8/4/2006	9082803	1	2	25	54	2	2	2				
8/7/2007	9082803	1	2				1	2	2	2		
9/13/2005	9082803	1	3					y				
8/4/2006	9082803	1	3	23	42	2	2	1				
8/7/2007	9082803	1	3				2	2	1	2	xL	yellow-green stalks
9/13/2005	9082803	3	1					y				
8/4/2006	9082803	3	1	18	51	2	1	1				
8/7/2007	9082803	3	1				1	1	1	1	x	fine stems, leaves, yellow-green
9/13/2005	9082803	3	2					y				

				Canopy	Culm	Leaf	Leafi-	Seed		Overall		
			Plant	spread	height	width	ness	heads	Lodging	size		
Date	Accession	Row	No.	(inches)	(inches)	rating	rating	rating	rating	rating	Selected	Comments
8/4/2006	9082803	3	2	36	51	2	1	1				
8/7/2007	9082803	3	2				2	2	3	2		
9/13/2005	9082803	3	3					y				
8/4/2006	9082803	3	3	22	42	2	2	1				
8/7/2007	9082803	3	3				2	2	2	2		
9/13/2005	9082803	6	1					y				
8/4/2006	9082803	6	1	27	57	2	1	1				
8/7/2007	9082803	6	1				2	1	2	2		
9/13/2005	9082803	6	2					y				
8/4/2006	9082803	6	2	27	42	1	1	1				
8/7/2007	9082803	6	2				1	1	2	2	x	short
9/13/2005	9082803	6	3					y				
8/4/2006	9082803	6	3	18	48	2	2	1				
8/7/2007	9082803	6	3				2	2	3	2		
9/13/2005	9082804	2	1					y				
8/4/2006	9082804	2	1	23	36	2	3	3				
8/7/2007	9082804	2	1				2	2	2	2		
9/13/2005	9082804	2	2					y				
8/4/2006	9082804	2	2	20	36	3	3	3				
8/7/2007	9082804	2	2				1	2	2	2		
9/13/2005	9082804	2	3					y				
8/4/2006	9082804	2	3	12	18	3	3	3				
8/7/2007	9082804	2	3				1	2	1	2		
9/13/2005	9082804	3	1					y				
8/4/2006	9082804	3	1	35	54	2	3	2				lodged, boot
8/7/2007	9082804	3	1				2	2	2	1		
9/13/2005	9082804	3	2					y				
8/4/2006	9082804	3	2	26	63	3	1	1				
8/7/2007	9082804	3	2				1	1	1	1	x	coarse leaves, powder blue
9/13/2005	9082804	3	3					y				
8/4/2006	9082804	3	3	36	48	2	1	2				boot
8/7/2007	9082804	3	3				1	2	2	1		

				Canopy	Culm	Leaf	Leafi-	Seed		Overall		
			Plant	spread	height	width	ness	heads	Lodging	size		
Date	Accession	Row	No.	(inches)	(inches)	rating	rating	rating	rating	rating	Selected	Comments
9/13/2005	9082804	5	1	DEAD								
9/13/2005	9082804	5	2					y				in sheath
8/4/2006	9082804	5	2	24	54	3	1	2				boot
8/7/2007	9082804	5	2				1	1	1	1	x	coarse
9/13/2005	9082804	5	3					n				
8/4/2006	9082804	5	3	8	6	2	3	3				boot
8/7/2007	9082804	5	3	DEAD								
9/13/2005	9082806	1	1					y				
8/4/2006	9082806	1	1	29	48	2	1	1				
8/7/2007	9082806	1	1				1	1	1	1	x	gray green
9/13/2005	9082806	1	2					y				small
8/4/2006	9082806	1	2	12	39	2	1	1				
8/7/2007	9082806	1	2				2	2	1	2		
9/13/2005	9082806	1	3					y				leafy
8/4/2006	9082806	1	3	21	51	2	1	1				very upright
8/7/2007	9082806	1	3				1	1	1	1	x	gray green
9/13/2005	9082806	4	1					n				small
8/4/2006	9082806	4	1	4	6	2	3	3				very small, no heads
8/7/2007	9082806	4	1	DEAD								
9/13/2005	9082806	4	2					y				few heads
8/4/2006	9082806	4	2	26	48	2	2	2				
8/7/2007	9082806	4	2				1	2	2	1		late maturing
9/13/2005	9082806	4	3					n				
8/4/2006	9082806	4	3	11	39	3	2	2				
8/7/2007	9082806	4	3				2	2	1	2		
9/13/2005	9082806	5	1					y				2 small culms
8/4/2006	9082806	5	1	8	48	2	3	1				
8/7/2007	9082806	5	1				2	2	1	2		
9/13/2005	9082806	5	2					y				
8/4/2006	9082806	5	2	19	48	2	2	2				
8/7/2007	9082806	5	2				2	2	1	2		
9/13/2005	9082806	5	3					y				

Date	Accession	Row	Plant No.	Canopy spread (inches)	Culm height (inches)	Leaf width rating	Leafi-ness rating	Seed heads rating	Lodging rating	Overall size rating	Selected	Comments
8/4/2006	9082806	5	3	17	48	2	2	2				
8/7/2007	9082806	5	3				2	2	1	2		
9/13/2005	9082807	2	1					n				very small
8/4/2006	9082807	2	1	2	5	2	3	3				
8/7/2007	9082807	2	1				3	3	2	3		
9/13/2005	9082807	2	2					y				
8/4/2006	9082807	2	2	30	48	2	1	1				
8/7/2007	9082807	2	2				2	2	2	2		
9/13/2005	9082807	2	3					y				
8/4/2006	9082807	2	3	30	54	2	2	2				
8/7/2007	9082807	2	3				3	2	2	3		
9/13/2005	9082807	4	1					y				flowering
8/4/2006	9082807	4	1	22	57	2	2	1				
8/7/2007	9082807	4	1				1	1	2	1	x	dark green, coarse leaves
9/13/2005	9082807	4	2					y				flowering
8/4/2006	9082807	4	2	17	36	1	2	2				
8/7/2007	9082807	4	2				2	1	1	2	xL	very fuzzy head
9/13/2005	9082807	4	3					y				flowering
8/4/2006	9082807	4	3	26	51	2	3	1				
8/7/2007	9082807	4	3				2	2	1	1		
9/13/2005	9082807	6	1	DEAD								
9/13/2005	9082807	6	2					y				
8/4/2006	9082807	6	2	22	48	1	1	1				
8/7/2007	9082807	6	2				1	1	1	1	x	yellow-green
9/13/2005	9082807	6	3					y				
8/4/2006	9082807	6	3	12	42	1	1	1				
8/7/2007	9082807	6	3				2	1	1	2		
9/13/2005	9082808	1	1					y				
8/4/2006	9082808	1	1	21	36	1	1	2				boot
8/7/2007	9082808	1	1				1	1	1	1	x	yellow-green
9/13/2005	9082808	1	2					n				
8/4/2006	9082808	1	2	17	45	2	2	2				powder blue, boot

Date	Accession	Row	Plant No.	Canopy spread (inches)	Culm height (inches)	Leaf width rating	Leafi-ness rating	Seed heads rating	Lodging rating	Overall size rating	Selected	Comments
8/7/2007	9082808	1	2				2	2	1	2		
9/13/2005	9082808	1	3					y				
8/4/2006	9082808	1	3	26	48	2	2	1				very hairy heads
8/7/2007	9082808	1	3				2	1	1	2		
9/13/2005	9082808	4	1					y				
8/4/2006	9082808	4	1	22	45	2	2	1				
8/7/2007	9082808	4	1				1	1	1	2	x	
9/13/2005	9082808	4	2					y				
8/4/2006	9082808	4	2	26	54	2	1	2				
8/7/2007	9082808	4	2				2	1	2	1	x	
9/13/2005	9082808	4	3					y				
8/4/2006	9082808	4	3	23	54	2	2	1				
8/7/2007	9082808	4	3				1	2	1	1	x	
9/13/2005	9082808	5	1					y				1 in sheath
8/4/2006	9082808	5	1	32	57	3	2	2				
8/7/2007	9082808	5	1				2	2	3	1		
9/13/2005	9082808	5	2					y				
8/4/2006	9082808	5	2	19	48	2	1	1				
8/7/2007	9082808	5	2				1	1	1	1	x	
9/13/2005	9082808	5	3					n				
8/4/2006	9082808	5	3	11	33	3	2	3				boot
8/7/2007	9082808	5	3				2	2	2	2		
9/13/2005	9082809	1	1					y				
8/4/2006	9082809	1	1	35	45	2	1	1				
8/7/2007	9082809	1	1				2	1	1	2	x	light green
9/13/2005	9082809	1	2					y				
8/4/2006	9082809	1	2	21	45	2	3	2				lodged,very basal leaves
8/7/2007	9082809	1	2				2	2	3	2		
9/13/2005	9082809	1	3					y				
8/4/2006	9082809	1	3	25	24	1	2	2				very blue, boot
8/7/2007	9082809	1	3				2	2	2	2		
9/13/2005	9082809	3	1					y				

Date	Accession	Row	Plant No.	Canopy spread (inches)	Culm height (inches)	Leaf width rating	Leafi-ness rating	Seed heads rating	Lodging rating	Overall size rating	Selected	Comments
8/4/2006	9082809	3	1	36	42	2	2	1				
8/7/2007	9082809	3	1	No data								big bluestem
9/13/2005	9082809	3	2					y				
8/4/2006	9082809	3	2	23	36	3	3	3				lodged
8/7/2007	9082809	3	2				2	2	2	2		
9/13/2005	9082809	3	3					y				
8/4/2006	9082809	3	3	20	51	2	3	2				
8/7/2007	9082809	3	3				1	2	2	2		
9/13/2005	9082809	5	1					y				
8/4/2006	9082809	5	1	26	48	3	2	1				
8/7/2007	9082809	5	1	No data								big bluestem
9/13/2005	9082809	5	2					y				2 culms
8/4/2006	9082809	5	2	26	36	3	3	2				
8/7/2007	9082809	5	2				2	2	3	2		
9/13/2005	9082809	5	3					y				
8/4/2006	9082809	5	3	31	60	3	1	1				
8/7/2007	9082809	5	3				1	1	1	1	x	blue/gray
9/13/2005	9082810	1	1					y				bbs
8/4/2006	9082810	1	1	10	41	1	3	2				
8/7/2007	9082810	1	1				2	2	1	2		big bluestem?
9/13/2005	9082810	1	2					y				big bluestem
8/4/2006	9082810	1	2	17	45	2	3	2				
8/7/2007	9082810	1	2				2	2	3	2		hybrid?
9/13/2005	9082810	1	3					y				big bluestem
8/4/2006	9082810	1	3	17	63	2	2	1				red stemmed
8/7/2007	9082810	1	3				2	1	1	2	x	hybrid?, lt.green,purple/red stalks
9/13/2005	9082810	4	1					y				in sheath
8/4/2006	9082810	4	1	13	63	2	2	2				
8/7/2007	9082810	4	1				2	2	2	2		
9/13/2005	9082810	4	2					y				
8/4/2006	9082810	4	2	30	63	2	2	2				
8/7/2007	9082810	4	2				1	2	3	1		

				Canopy	Culm	Leaf	Leafi-	Seed		Overall		
			Plant	spread	height	width	ness	heads	Lodging	size		
Date	Accession	Row	No.	(inches)	(inches)	rating	rating	rating	rating	rating	Selected	Comments
9/13/2005	9082810	4	3					y				
8/4/2006	9082810	4	3	22	54	2	2	1				
8/7/2007	9082810	4	3				1	1	1	2	x	
9/13/2005	9082810	6	1					y				
8/4/2006	9082810	6	1	36	54	1	2	1				
8/7/2007	9082810	6	1				2	1	2	2		
9/13/2005	9082810	6	2					y				
8/4/2006	9082810	6	2	34	51	1	1	1				big bluestem?
8/7/2007	9082810	6	2	No data								big bluestem
9/13/2005	9082810	6	3					y				
8/4/2006	9082810	6	3	21	42	2	3	2				
8/7/2007	9082810	6	3				2	2	2	2		
9/13/2005	9082811	2	1					y				
8/4/2006	9082811	2	1	23	45	2	1	2				
8/7/2007	9082811	2	1				1	1	1	1	x	upright
9/13/2005	9082811	2	2					y				
8/4/2006	9082811	2	2	18	54	2	2	1				
8/7/2007	9082811	2	2				1	1	2	1	x	
9/13/2005	9082811	2	3					y				
8/4/2006	9082811	2	3	19	57	3	2	1				
8/7/2007	9082811	2	3				1	1	3	1		
9/13/2005	9082811	3	1					n				
8/4/2006	9082811	3	1	14	18	2	2	3				no heads
8/7/2007	9082811	3	1				2	3	1	3		
9/13/2005	9082811	3	2					y				
8/4/2006	9082811	3	2	34	42	2	1	1				
8/7/2007	9082811	3	2				1	1	1	1	x	hybrid?
9/13/2005	9082811	3	3					y				in sheath
8/4/2006	9082811	3	3	26	48	3	2	2				boot
8/7/2007	9082811	3	3				1	2	1	2		disease
9/13/2005	9082811	5	1					y				
8/4/2006	9082811	5	1	25	54	3	1	1				

Date	Accession	Row	Plant No.	Canopy spread (inches)	Culm height (inches)	Leaf width rating	Leafi-ness rating	Seed heads rating	Lodging rating	Overall size rating	Selected	Comments
8/7/2007	9082811	5	1				2	2	2	1		
9/13/2005	9082811	5	2					y				
8/4/2006	9082811	5	2	16	48	2	1	1				big bluestem?
8/7/2007	9082811	5	2	No data								big bluestem
9/13/2005	9082811	5	3					y				
8/4/2006	9082811	5	3	18	51	2	1	1				big bluestem?
8/7/2007	9082811	5	3	No data								big bluestem
9/13/2005	9082812	1	1					y				
8/4/2006	9082812	1	1	21	51	2	1	2				upright
8/7/2007	9082812	1	1				1	1	2	1	x	gray green
9/13/2005	9082812	1	2					y				
8/4/2006	9082812	1	2	12	39	2	2	2				
8/7/2007	9082812	1	2				1	2	1	2	x	
9/13/2005	9082812	1	3					y				
8/4/2006	9082812	1	3	18	42	2	1	1				
8/7/2007	9082812	1	3				2	2	1	2		
9/13/2005	9082812	4	1					n				small
8/4/2006	9082812	4	1	8	72	2	3	3				
8/7/2007	9082812	4	1				2	2	1	3		
9/13/2005	9082812	4	2					y				sml,shea
8/4/2006	9082812	4	2	10	30	2	2	3				boot
8/7/2007	9082812	4	2				1	2	1	2		
9/13/2005	9082812	4	3					y				
8/4/2006	9082812	4	3	16	57	2	2	1				
8/7/2007	9082812	4	3				1	1	1	1	x	powder blue
9/13/2005	9082812	5	1					y				
8/4/2006	9082812	5	1	18	54	3	2	2				
8/7/2007	9082812	5	1				1	2	1	1	x	
9/13/2005	9082812	5	2					y				
8/4/2006	9082812	5	2	15	54	3	2	2				
8/7/2007	9082812	5	2				1	1	1	1	x	
9/13/2005	9082812	5	3					y				in sheath

Date	Accession	Row	Plant No.	Canopy spread (inches)	Culm height (inches)	Leaf width rating	Leafi-ness rating	Seed heads rating	Lodging rating	Overall size rating	Selected	Comments
8/4/2006	9082812	5	3	14	48	2	1	2				
8/7/2007	9082812	5	3				1	1	1	1	x	
9/13/2005	9082824	6	1					y				
8/4/2006	9082824	6	1	4	54	3	3	3				lodged, poor big bluestem
8/7/2007	9082824	6	1				3	3	2	2		big bluestem?
9/13/2005	9082827	1	1					n				
8/4/2006	9082827	1	1	13	51	1	3	2				powder blue
8/7/2007	9082827	1	1				2	2	2	2		
9/13/2005	9082827	1	2					y				
8/4/2006	9082827	1	2	20	57	2	2	2				
8/7/2007	9082827	1	2				2	2	2	2		
9/13/2005	9082827	1	3					y				
8/4/2006	9082827	1	3	26	42	2	3	2				
8/7/2007	9082827	1	3				2	2	3	2		
9/13/2005	9082827	3	1					y				
8/4/2006	9082827	3	1	31	57	2	2	2				
8/7/2007	9082827	3	1	No data								big bluestem
9/13/2005	9082827	3	2					y				1 head
8/4/2006	9082827	3	2	22	45	2	2	1				
8/7/2007	9082827	3	2				1	1	1	2	x	gray green
9/13/2005	9082827	3	3					n				
8/4/2006	9082827	3	3	18	54	1	2	2				
8/7/2007	9082827	3	3				2	1	2	1		hybrid?
9/13/2005	9082827	5	1					n				
8/4/2006	9082827	5	1	13	36	1	2	2				
8/7/2007	9082827	5	1				1	1	1	2	x	fine leaf
9/13/2005	9082827	5	2					y				
8/4/2006	9082827	5	2	25	48	2	1	1				
8/7/2007	9082827	5	2				1	2	2	1		big bluestem?
9/13/2005	9082827	5	3					y				1 in sheath
8/4/2006	9082827	5	3	20	48	2	2	1				
8/7/2007	9082827	5	3				1	2	2	1		

				Canopy	Culm	Leaf	Leafi-	Seed		Overall		
			Plant	spread	height	width	ness	heads	Lodging	size		
Date	Accession	Row	No.	(inches)	(inches)	rating	rating	rating	rating	rating	Selected	Comments
9/13/2005	9082881	1	1					y				small
8/4/2006	9082881	1	1	20	45	2	2	2				
8/7/2007	9082881	1	1				2	2	2	2		
9/13/2005	9082881	1	2					y				
8/4/2006	9082881	1	2	24	54	2	2	1				
8/7/2007	9082881	1	2				2	1	2	2		
9/13/2005	9082881	1	3					y				
8/4/2006	9082881	1	3	18	36	2	3	2				
8/7/2007	9082881	1	3				2	2	1	2		
9/13/2005	9082881	3	1					n				
8/4/2006	9082881	3	1	DEAD								
9/13/2005	9082881	3	2					y				very small
8/4/2006	9082881	3	2	16	26	1	2	2				
8/7/2007	9082881	3	2				2	2	1	3		
9/13/2005	9082881	3	3					n				
8/4/2006	9082881	3	3	14	36	2	2	1				
8/7/2007	9082881	3	3				1	1	1	2	x	
9/13/2005	9082881	6	1					n				
8/4/2006	9082881	6	1	21	45	2	2	2				
8/7/2007	9082881	6	1				2	2	2	2		
9/13/2005	9082881	6	2					n				
8/4/2006	9082881	6	2	9	45	2	2	3				
8/7/2007	9082881	6	2				2	2	1	2		
9/13/2005	9082881	6	3					y				
8/4/2006	9082881	6	3	19	45	2	2	2				
8/7/2007	9082881	6	3				2	1	2	2		
9/13/2005	9082904	2	1					n				
8/4/2006	9082904	2	1	DEAD								
9/13/2005	9082904	2	2					y				sheath
8/4/2006	9082904	2	2	27	54	2	1	1				
8/7/2007	9082904	2	2				2	2	3	2		
9/13/2005	9082904	2	3					y				

				Canopy	Culm	Leaf	Leafi-	Seed		Overall		
			Plant	spread	height	width	ness	heads	Lodging	size		
Date	Accession	Row	No.	(inches)	(inches)	rating	rating	rating	rating	rating	Selected	Comments
8/4/2006	9082904	2	3	28	48	3	3	2				
8/7/2007	9082904	2	3				2	2	2	2		
9/13/2005	9082904	4	1					y				
8/4/2006	9082904	4	1	36	51	1	2	2				
8/7/2007	9082904	4	1				2	2	3	1		
9/13/2005	9082904	4	2					n				
8/4/2006	9082904	4	2	15	24	1	2	3				boot
8/7/2007	9082904	4	2				2	2	3	2		
9/13/2005	9082904	4	3					y				2 culms
8/4/2006	9082904	4	3	24	36	1	2	3				boot
8/7/2007	9082904	4	3				2	2	2	2		
9/13/2005	9082904	6	1					y				
8/4/2006	9082904	6	1	24	51	1	2	2				
8/7/2007	9082904	6	1				2	2	3	2		
9/13/2005	9082904	6	2					y				
8/4/2006	9082904	6	2	26	51	1	2	2				
8/7/2007	9082904	6	2				2	2	3	2		
9/13/2005	9082904	6	3					n				
8/4/2006	9082904	6	3	8	18	3	3	3				boot
8/7/2007	9082904	6	3				3	3	3	2		
9/13/2005	9082905	2	1					y				
8/4/2006	9082905	2	1	26	51	2	2	1				
8/7/2007	9082905	2	1				2	1	2	2		
9/13/2005	9082905	2	2					n				very small
8/4/2006	9082905	2	2	5	48	2	3	3				
8/7/2007	9082905	2	2				2	2	2	2		
9/13/2005	9082905	2	3					n				
8/4/2006	9082905	2	3	11	54	2	3	2				
8/7/2007	9082905	2	3				2	2	2	1		
9/13/2005	9082905	3	1					n				small
8/4/2006	9082905	3	1	9	42	2	2	2				
8/7/2007	9082905	3	1				1	2	1	2		

Date	Accession	Row	Plant No.	Canopy spread (inches)	Culm height (inches)	Leaf width rating	Leafi-ness rating	Seed heads rating	Lodging rating	Overall size rating	Selected	Comments
9/13/2005	9082905	3	2					y				
8/4/2006	9082905	3	2	16	45	1	2	2				
8/7/2007	9082905	3	2				1	1	1	1	x	yellow-green
9/13/2005	9082905	3	3					y				in sheath
8/4/2006	9082905	3	3	8	39	2	2	3				
8/7/2007	9082905	3	3				1	2	1	1		
9/13/2005	9082905	6	1	DEAD								
9/13/2005	9082905	6	2					y				
8/4/2006	9082905	6	2	23	69	3	1	1				big bluestem?
8/7/2007	9082905	6	2									
9/13/2005	9082905	6	3					y				
8/4/2006	9082905	6	3	20	60	3	1	1				big bluestem?
8/7/2007	9082905	6	3				1	1	1	1		coarse
9/13/2005	Garden	1	1					y				
8/4/2006	Garden	1	1	20	63	2	2	2				
8/7/2007	Garden	1	1				1	2	2	1	x	blue
9/13/2005	Garden	1	2					y				
8/4/2006	Garden	1	2	20	72	2	2	1				
8/7/2007	Garden	1	2				1	2	2	1	x	blue
9/13/2005	Garden	1	3					y				
8/4/2006	Garden	1	3	36	66	2	2	2				boot, no heads
8/7/2007	Garden	1	3				2	2	3	1		
9/13/2005	Garden	3	1					y				
8/4/2006	Garden	3	1	17	72	2	2	1				
8/7/2007	Garden	3	1					1	1	1		yellow stem
9/13/2005	Garden	3	2					y				
8/4/2006	Garden	3	2	23	66	3	1	1				
8/7/2007	Garden	3	2				1	2	2	1		
9/13/2005	Garden	3	3					y				
8/4/2006	Garden	3	3	17	81	3	2	1				
8/7/2007	Garden	3	3				1	1	1	1		
9/13/2005	Garden	6	1					y				

Date	Accession	Row	Plant No.	Canopy spread (inches)	Culm height (inches)	Leaf width rating	Leafi-ness rating	Seed heads rating	Lodging rating	Overall size rating	Selected	Comments
8/4/2006	Garden	6	1	28	84	3	1	1				
8/7/2007	Garden	6	1				2	2	3	1		
9/13/2005	Garden	6	2					y				
8/4/2006	Garden	6	2	23	81	3	1	1				
8/7/2007	Garden	6	2				2	2	3	1		
9/13/2005	Garden	6	3					y				
8/4/2006	Garden	6	3	24	60	2	1	1				
8/7/2007	Garden	6	3				1	1	1	1	x	
9/13/2005	sher1	6	1					y				
8/4/2006	sher1	6	3	7	24	2	3	1				
8/7/2007	sher1	6	3	No data								big bluestem
9/13/2005	sher2	2	1					y				
8/4/2006	sher2	2	1	4	12	2	3	3				big bluestem?
8/7/2007	sher2	2	1	No data								big bluestem
9/13/2005	sher2	2	2					y				
8/4/2006	sher2	2	2	18	63	2	2	1				big bluestem?
8/7/2007	sher2	2	2	No data								big bluestem
9/13/2005	sher2	2	3					n				
8/4/2006	sher2	2	3	9	15	2	3	3				big bluestem?
8/7/2007	sher2	2	3	No data								big bluestem
9/13/2005	sher2	4	1					y				
8/4/2006	sher2	4	1	23	45	2	2	1				big bluestem?
8/7/2007	sher2	4	1					2	2	2		
9/13/2005	sher2	4	2					y				
8/4/2006	sher2	4	2	12	69	2	3	2				big bluestem?
8/7/2007	sher2	4	2	No data								big bluestem
9/13/2005	sher2	4	3					y				
8/4/2006	sher2	4	3	16	72	2	1	1				big bluestem?
8/7/2007	sher2	4	3	No data								big bluestem
9/13/2005	sher2	5	1					y				
8/4/2006	sher2	5	1	10	66	2	2	1				big bluestem?
8/7/2007	sher2	5	1	No data								big bluestem

				Canopy	Culm	Leaf	Leafi-	Seed		Overall		
			Plant	spread	height	width	ness	heads	Lodging	size		
Date	Accession	Row	No.	(inches)	(inches)	rating	rating	rating	rating	rating	Selected	Comments
9/13/2005	sher2	5	2					n				big bluestem?
8/4/2006	sher2	5	2	6	42	2	3	3				big bluestem?
8/7/2007	sher2	5	2									
9/13/2005	sher2	5	3	No data				y				big bluestem
8/4/2006	sher2	5	3	7	54	2	3	2				big bluestem?
8/7/2007	sher2	5	3									
9/13/2005	sher3	2	1					y				
8/4/2006	sher3	2	1	19	66	2	2	2				big bluestem?
8/7/2007	sher3	2	1	No data								big bluestem
9/13/2005	sher3	2	2					y				
8/4/2006	sher3	2	2	17	66	2	2	2				big bluestem?
8/7/2007	sher3	2	2	No data								big bluestem
9/13/2005	sher3	2	3					y				
8/4/2006	sher3	2	3	15	72	2	2	1				big bluestem?
8/7/2007	sher3	2	3	No data								big bluestem
9/13/2005	sher3	4	1					y				
8/4/2006	sher3	4	1	17	75	2	2	1				big bluestem?
8/7/2007	sher3	4	1	No data								big bluestem
9/13/2005	sher3	4	2					y				
8/4/2006	sher3	4	2	21	72	3	2	1				big bluestem?
8/7/2007	sher3	4	2	No data								big bluestem
9/13/2005	sher3	4	3					y				
8/4/2006	sher3	4	3	23	66	3	2	2				big bluestem?
8/7/2007	sher3	4	3	No data								big bluestem
9/13/2005	sher3	6	1					y				
8/4/2006	sher3	6	1	12	69	3	1	2				big bluestem?
8/7/2007	sher3	6	1	No data								big bluestem
9/13/2005	sher3	6	2					y				
8/4/2006	sher3	6	2	21	69	3	2	1				big bluestem?
8/7/2007	sher3	6	2	No data								big bluestem
9/13/2005	sher3	6	3					y				
8/4/2006	sher3	6	3	15	66	3	2	2				big bluestem?

Date	Accession	Row	Plant No.	Canopy spread (inches)	Culm height (inches)	Leaf width rating	Leafi-ness rating	Seed heads rating	Lodging rating	Overall size rating	Selected	Comments
8/7/2007	sher3	6	3	No data								big bluestem
9/13/2005	sher4	6	1					y				
8/4/2006	sher4	6	1	26	42	2	1	1				
8/7/2007	sher4	6	1					1	1	1	x	yellow-green
9/13/2005	sher5	2	1					y				
8/4/2006	sher5	2	1	22	54	2	2	1				big bluestem?
8/7/2007	sher5	2	1	No data								big bluestem
9/13/2005	sher5	2	2					y				
8/4/2006	sher5	2	2	32	45	2	2	2				big bluestem?
8/7/2007	sher5	2	2				1	2	2	1		hybrid?
9/13/2005	sher5	2	3					y				
8/4/2006	sher5	2	3	27	51	2	2	1				big bluestem?
8/7/2007	sher5	3	1	No data								big bluestem
9/13/2005	sher5	3	1					y				
8/4/2006	sher5	3	1	21	57	2	2	2				big bluestem?
8/7/2007	sher5	3	1	No data								big bluestem
9/13/2005	sher5	3	2					y				
8/4/2006	sher5	3	2	28	57	2	2	2				big bluestem?
8/7/2007	sher5	3	2	No data								big bluestem
9/13/2005	sher5	3	3					y				
8/4/2006	sher5	3	3	30	57	2	2	1				big bluestem?
8/7/2007	sher5	3	3	No data								big bluestem
9/13/2005	sher5	5	1					y				
8/4/2006	sher5	5	1	16	51	2	2	2				big bluestem?
8/7/2007	sher5	5	1	No data								big bluestem
9/13/2005	sher5	5	2					y				
8/4/2006	sher5	5	2	15	66	2	2	1				big bluestem?
8/7/2007	sher5	5	2	No data								big bluestem
9/13/2005	sher5	5	3					y				
8/4/2006	sher5	5	3	25	54	2	1	2				big bluestem?
8/7/2007	sher5	5	3	No data								big bluestem

ACTIVE STUDIES: TECHNICAL REPORT 2007

Study NDPMC-P-0404-RA

Study Title: Evaluation and Increase of Indiangrass *Sorghastrum nutans*

Objective: The purpose of this study is to identify and release an Indiangrass for use in urban and rural landscaping. A second objective is to identify and release another population of Indiangrass that is a good forage producer for use in livestock production

Cooperators: USDA, NRCS, Bismarck Plant Materials Center; University of Minnesota; South Dakota State University, Brookings, South Dakota

Description**:** Indiangrass is a tall, native, warm-season grass that is bunchy, but has short, stout rhizomes. It grows 2-6 tall. The leaves are often a gray-green color and are somewhat stiff and straight. The attractive seedheads are panicles that are reddish gold and softly hairy.

Distribution**:** Indiangrass is most commonly associated with big bluestem and switchgrass in tallgrass prairies. It is found in southeast Canada, through much of the central and eastern United States, and into Mexico. It is not generally found west of the Great Plains. It prefers deep, well-drained floodplain soils and moister conditions than big bluestem.

Methods and Materials

Collection**:** Portions of plants were dug from an existing Indiangrass nursery at the north corner of the Agronomy Farm, South Dakota State University. The nursery had been planted in the 1970's-1980's from seedlings started from two seed collections, one from Aurora, east of Brookings, South Dakota, and one from an area around Yankton, South Dakota. Plants from the two sources could be distinguished by their leaf width and texture. The Yankton source, which is a more southern source had wider, coarser leaves than the Aurora source plants. Plants that were colorful or had unusual growth favorable for landscaping were flagged in the fall of 2004 by Dwight Tober and Nancy Jensen, PMC personnel; Dr. Mary Meyer, University of Minnesota; and Dr. Arvid Boe, South Dakota State University. Portions of the selected plants were dug the following spring on April 12, 2005, from the Brookings nursery. One portion of each selection was delivered to Dr. Mary Meyer at the University of Minnesota Arboretum and the remaining portion was taken to the Plant Materials Center. Additional Indiangrass plants were collected at native sites in Minnesota. These were grown only at the PMC.

The plant/root were kept dormant prior to greenhouse planting. They were kept in a tree cooler which was dark, damp and cool. Plantlets were split off from root chunks that had been collected at SDSU and native locations. Each individual plantlet was planted into Miracle Grow Potting Mix in cone-tainers and placed in the greenhouse to grow from April 25, 2005, to June 7, 2005, when they were planted into the field in panel A. The plants in the greenhouse were very slow to grow in size. Plants were hardened off in the lath house for two weeks prior to planting in the field.

Assembly: See Table IG-1 for accession information.

Planting Plan: Plantlets were planted to a field north of the sand bluestem in Panel A at the PMC. Each accession was planted in a three-plant plot. The accessions were randomized within the three replications. Plants were spaced 42 inches apart and rows were 42 inches apart. See Figure IG-1 for field plot map.

Site Preparation: The field was black fallowed prior to planting. Previous plant material in the field was *Carex atherodes*. The site was tilled and packed prior to planting.

Planting Method: Plants were hand planted using a specially made dibble bar that produces holes the size and length of roots within the cone-tainers.

Planting Date: 4/12/2005

Maintenance:

2005	2006	2007
Plants were shallow tilled with small front-tine, walk-behind tiller	Plants were shallow tilled with small, front-tine, walk-behind tiller	Plants were shallow tilled with small, front-tine, walk-behind tiller
Weed were hoed throughout season	Weeds were hoed throughout season	Weeds were hand-rogued throughout the season
Irrigated-once in July, and once on 9/23/2005	Irrigated once in July due to severe drought conditions	No irrigation
No fertilizer	No fertilizer	No fertilizer
Spot sprayed small thistle patch between row with Curtail	Spot sprayed small thistle patch between row with Curtail and Roundup	

Data Collection: Notes on survival and a few comments on color were noted in 2005. As this was the transplant year, no extensive data was collected. Data collected in 2006 included plant height, leafiness, and culms produced. See Table IG-2 for data.

Results and Discussion

Plant survival in the greenhouse was greater than 90 percent. Plant survival in the field in 2005 was greater than 90 percent. Some color differences were seen. In 2006, the plants had excellent plant growth despite drought conditions. Differences in phenology and growth characteristics were exhibited in 2006. Some accessions produced viable seed before freeze-up. Phenology was not recorded in 2006. Data was collected twice in 2007. Data collected in September 2007 indicated seed ripeness.

Some plants displayed an upright stature and showed some color variation, making them desirable for landscaping. Some plants were also fine leaved, and leafy making them desirable for forage production. In 2007, plants were initially rated for landscaping or forage. Plants will be rated again in 2008 and selected in 2009.

Table IG-1. Indiangrass collection information.

No.	Accession	State	County	Location
A1	9091979			
A2	9091980			
A3	9091981			
A4	9091982			
A5	9091983			
A6	9091984			
A7	9091985			
A8	9091986			
A9	9091987			
A10	9091988			
A11	9091989			
A12	9091990			
Y1	9091991			
Y2	9091992			
Y3	9091993			
Y4	9091994			
Y5	9091995			
Y6	9091996			
Y7	9091997			
Y8	9091998			
Y9	9091999			
Y10	9092000			
Y11	9092001			
Y12	9092002			
Y13	9092003			
Y14	9092004			
L1	9092005	MN	Redwood	U of M SW Outreach and Research Center, Lamberton, near Cottonwood River in native prairie
L2	9092006	MN	Redwood	U of M SW Outreach and Research Center, Lamberton, near Cottonwood River in native prairie
L3	9092007	MN	Redwood	U of M SW Outreach and Research Center, Lamberton, near Cottonwood River in native prairie
K1	9092008	MN	Douglas	near Kensington, MN between road and railroad
P1	9092009	MN	Redwood	coll. 4/13/2005 Lamberton Twp, Sec.29, 2 miles from Revere along Pell Cr., Brian Pfarr landowner
P2	9092010	MN	Redwood	coll. 4/13/2005 Lamberton Twp, Sec.29, 2 miles from Revere along Pell Cr., Brian Pfarr landowner
E1	9092011	MN	Sherburne	coll. 4/13/2005 Elk River FO, Gina Hugo, T33N. R27 NW1/4of SW1/2 sec14
E2	9092012	MN	Sherburne	coll. 4/13/2005 Elk River FO, Gina Hugo, T33N. R27 NW1/4of SW1/2 sec14
E3	9092013	MN	Sherburne	coll. 4/13/2005 Elk River FO, Gina Hugo, T33N. R27 NW1/4of SW1/2 sec14
KN10	9092017	MN	Kittson	SW1/4 SE1/4 Sec.10 T160N R 46W(Norway Township) fine and medium sands, Al Gustafson
KN15	9092018	MN	Kittson	NW1/4 NE1/4 Sec.15 T160N. R46W(Norway Township) loamy fine sand, Al Gustafson
KN30	9092019	MN	Kittson	NE1/4 SE1/4 Sec.30 T160N. R46W(Norway Township) Arveson fine sandy loam, Al Gustafson
Tom1	9092014	ND		PMC field
Tom2	9092015	ND		PMC field
Tom3	9092016	ND		PMC field
Holt		NE		seed from KS PMC, started in the Greenhouse
H1	NONE	MN	Pine	Hinkley FO, Julie Lindner, SCT, Pine Co., MN SE1/4 of NE1/4 Sec.20 T39N R21W - poor root sample

A1 - A12
Vegetative material dug 4/12/2005 from Dr. Arvid Boe's assembly at SDSU Agronomy Farm east of campus, just west of I-29 and at SDSU Research Farm near Aurora, east of I-29. Original material had been collected by Dr. Ross of SDSU in the 1970's from the Aurora Prairie east of Brookings.

Y1 - Y14
Vegetative material dug 4/12/2005 from Dr. Arvid Boe's assembly at SDSU Agronomy Farm east of campus, just west of I-29 and at SDSU Research farm near Aurora, east of I-29. Original material had been collected by Dr. Ross of SDSU in the 1970's from a site near Yankton, South Dakota.

Figure IG-1. Plot Layout of Indiangrass assembly.

Species: **Indiangrass** *Sorghastrum nutans*
Location: **Panel A**
Planting Date: 6/7/2005
Spacing between rows = 42 inches (3.5 feet)
Spacing between plants = 42 inches (3.5 feet)

N ←

East

Row13	Row12	Row11	Row10	Row9	Row8	Row7	Row6	Row5	Row4	Row3	Row2	Row1
	TOM3	Y3	A6	Y14	Y2	A3	A4		KN10	L1	Y6	A9
	TOM3	Y3	A6	Y14	Y2	A3	A4		KN10	L1	Y6	A9
	TOM3	Y3	A6	Y14	Y2	A3	A4		KN10	L1	Y6	A9
	E2	A4	Y14	A6	HOLT	Y9	L2		E3	Y14	Y5	A8
	E2	A4	Y14	A6	HOLT	Y9	L2		E3	Y14	Y5	A8
	E2	A4	Y14	A6	HOLT	Y9	L2		E3	Y14	Y5	A8
	L3	HOLT	A1	L1	P1	KN30	E3		E2	Y13	Y4	A7
Y8	L3	HOLT	A1	L1	P1	KN30	E3		E2	Y13	Y4	A7
L1	L3	HOLT	A1	L1	P1	KN30	E3		E2	Y13	Y4	A7
K1	E3	A12	Y2	Y5	A1	A5	Y3	HOLT	E1		Y3	A6
Y9	E3	A12	Y2	Y5	A1	A5	Y3	HOLT	E1	Y12	Y3	A6
E1	E3	A12	Y2	Y5	A1	A5	Y3	HOLT	E1	Y12	Y3	A6
Y4	A5	Y5	Y7	Y4	Y6	L3	TOM2	TOM3	P2		Y2	A5
Y6	A5	Y5	Y7	Y4	Y6	L3	TOM2	TOM3	P2	Y11	Y2	A5
Y6	A5	Y5	Y7	Y4	Y6	L3	TOM2	TOM3	P2	Y11	Y2	A5
Y1	A8	A2	A9	KN10	E2	A2	E1	TOM2	P1	Y10	Y1	A4
Y1	A8	A2	A9	KN10	E2	A2	E1	TOM2	P1	Y10	Y1	A4
A10	A8	A2	A9	KN10	E2	A2	E1	TOM2	P1	Y10	Y1	A4
A10	TOM1	A7	A3	A11	Y8	Y7	K1	TOM1	K1	Y9	A12	A3
L2	TOM1	A7	A3	A11	Y8	Y7	K1	TOM1	K1	Y9	A12	A3
L2	TOM1	A7	A3	A11	Y8	Y7	K1	TOM1	K1	Y9	A12	A3
KN10	A11	P1	Rep 3	A7	A12	A9	Y1	KN30	L3	Y8	A11	A2
KN10	A11	P1		A7	A12	A9	Y1	KN30	L3	Y8	A11	A2
KN10	A11	P1	P2	A7	A12	A9	Y1	KN30	L3	Y8	A11	A2
KN30	TOM2	KN15	KN15	TOM1	A10	TOM3	A8	KN15	L2	Y7	A10	A1
KN30	TOM2	KN15	KN15	TOM1	A10	TOM3	A8	KN15	L2	Y7	A10	A1
KN30	TOM2	KN15	KN15	TOM1	A10	TOM3	A8	KN15	L2	Y7	A10	A1

South

Sand Blue stem

Hard Fescue Alley

Table IG-2. Indiangrass *Sorghastrum nutans* evaluation data, 2006-2007.

Key: **Ratings**

Accn.: accession number assigned
Leaf width: 1=narrow; 2=medium; 3=wide
Leafiness: 1=many leaves; 2=some leaves; 3=few leaves
Seed culms: 1=many culms; 2=some culms; 3=few culms
Phenology: 1=seed forming; 2=flowering; 3=boot
Lodging: 1=no lodging; 2=some lodging; 3=severe lodging
Size: 1=large, robust; 2=medium to large; 3=small
Color: 1=very colorful, showy; 2=some color; 3=not showy
Mature seed: 1=most heads with mature seed; 2=some mature seed; 3=no mature seed

Culm Ht.: seed culm height (inches)
Spread: width of plant crown (inches)
Select Forage: plants showing potential to be included in a forage release
Select Lscp: plants showing potential to be included in a landscape release

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/04/06	9091979	A1	1	1	1	2	1	45	15								
08/07/07	9091979	A1	1	1		2				2	1	2	2				
09/25/07	9091979	A1	1	1										1			
08/04/06	9091979	A1	1	2	1	2	2	42	24								
08/07/07	9091979	A1	1	2		2				2	1	2	2				
09/25/07	9091979	A1	1	2										1			
08/04/06	9091979	A1	1	3	2	2	2	54	18								
08/07/07	9091979	A1	1	3		2				2	1	1	2				
09/25/07	9091979	A1	1	3										1			
08/04/06	9091979	A1	8	1	2	1	1	42	34								
08/07/07	9091979	A1	8	1		2				2	2	2	2				stemmy
09/25/07	9091979	A1	8	1										1			fine leaves
08/04/06	9091979	A1	8	2	2	1	1	48	32								
08/07/07	9091979	A1	8	2		2				2	2	2	2				stemmy
09/25/07	9091979	A1	8	2										1			fine leaves
08/04/06	9091979	A1	8	3	2	1	1	51	28								
08/07/07	9091979	A1	8	3		2				2	2	2	2				stemmy

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
09/25/07	9091979	A1	8	3										1			fine leaves
08/04/06	9091979	A1	10	1	2	1	1	42	29								
08/07/07	9091979	A1	10	1		2				2	2	2	2				
09/25/07	9091979	A1	10	1										1			
08/04/06	9091979	A1	10	2	2	1	1	45	28								
08/07/07	9091979	A1	10	2		2				2	2	2	2				
09/25/07	9091979	A1	10	2										1			
08/04/06	9091979	A1	10	3	2	1	1	42	28								
08/07/07	9091979	A1	10	3		2				2	2	2	2				
09/25/07	9091979	A1	10	3										1			
08/04/06	9091980	A2	1	1	2	2	2	54	15								
08/07/07	9091980	A2	1	1		2				2	1	1	2				
09/25/07	9091980	A2	1	1										1			
08/04/06	9091980	A2	1	2	2	2	2	54	19								
08/07/07	9091980	A2	1	2		2				2	1	2	2				
09/25/07	9091980	A2	1	2										1			
08/04/06	9091980	A2	1	3	2	2	2	54	21								
08/07/07	9091980	A2	1	3		2				2	1	2	2				
09/25/07	9091980	A2	1	3										1			
08/04/06	9091980	A2	7	1	2	2	2	48	28								
08/07/07	9091980	A2	7	1		2				2	2	3	2				
09/25/07	9091980	A2	7	1										1			short
08/04/06	9091980	A2	7	2	2	2	2	45	28								lime green
08/07/07	9091980	A2	7	2		2				2	2	2	2				
09/25/07	9091980	A2	7	2										1			short
08/04/06	9091980	A2	7	3	2	2	2	51	24								
08/07/07	9091980	A2	7	3		2				2	2	1	2				
09/25/07	9091980	A2	7	3										1			short
08/04/06	9091980	A2	11	1	2	2	2	45	16								
08/07/07	9091980	A2	11	1		2				2	2	2	2				
09/25/07	9091980	A2	11	1										1			
08/04/06	9091980	A2	11	2	2	1	1	48	27								
08/07/07	9091980	A2	11	2		2				2	2	2	2				
09/25/07	9091980	A2	11	2										1			

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/04/06	9091980	A2	11	3	2	2	2	51	27								
08/07/07	9091980	A2	11	3		2				2	2	2	2				
09/25/07	9091980	A2	11	3										1			
08/04/06	9091981	A3	1	1	dead												
08/07/07	9091981	A3	1	1						m				m			
09/25/07	9091981	A3	1	1													
08/04/06	9091981	A3	1	2	1	2	3	42	17								
08/07/07	9091981	A3	1	2		1				2	1	2	1			x	red leaves, few heads
09/25/07	9091981	A3	1	2										2			red leaves, small
08/04/06	9091981	A3	1	3	1	2	2	45	15								
08/07/07	9091981	A3	1	3		1				2	1	2	1			x	
09/25/07	9091981	A3	1	3										1			red leaves, small
08/04/06	9091981	A3	7	1	1	3	3	15	11								red
08/07/07	9091981	A3	7	1		2				2	2	3	1				red leaves, not attract.
09/25/07	9091981	A3	7	1										1			very small, red,few
08/04/06	9091981	A3	7	2	1	3	2	42	22								red
08/07/07	9091981	A3	7	2		2				2	2	3	1				red leaves, not attract.
09/25/07	9091981	A3	7	2										1			very small,red, few
08/04/06	9091981	A3	7	3	1	3	2	42	18								red
08/07/07	9091981	A3	7	3		2				2	2	3	1				red leaves, not attract.
09/25/07	9091981	A3	7	3										1			very small, red, few
08/04/06	9091981	A3	10	1	2	2	3	30	19								red
08/07/07	9091981	A3	10	1		2				3	1	3	1				small plant, red
09/25/07	9091981	A3	10	1										3			red, small plant
08/04/06	9091981	A3	10	2	dead												
08/07/07	9091981	A3	10	2						m				m			
09/25/07	9091981	A3	10	2													
08/04/06	9091981	A3	10	3	2	2	3	39	18								red
08/07/07	9091981	A3	10	3		2				2	2	3	1				
09/25/07	9091981	A3	10	3										1			red, small plant
08/04/06	9091982	A4	1	1	1	2	2	51	18								
08/07/07	9091982	A4	1	1		1				2	1	2	2				
09/25/07	9091982	A4	1	1										1			
08/04/06	9091982	A4	1	2	2	2	2	48	21								disease

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/07/07	9091982	A4	1	2		2				2	1	3	3				chlorotic, small
09/25/07	9091982	A4	1	2										1			
08/04/06	9091982	A4	1	3	2	1	2	51	24								
08/07/07	9091982	A4	1	3		1				2	1	2	2		x		
09/25/07	9091982	A4	1	3										1			
08/04/06	9091982	A4	6	1	2	2	2	51	26								
08/07/07	9091982	A4	6	1		2				2	2	1	2				
09/25/07	9091982	A4	6	1										1			slight blue-green
08/04/06	9091982	A4	6	2	2	2	2	48	24								
08/07/07	9091982	A4	6	2		2				2	2	2	2				
09/25/07	9091982	A4	6	2										1			slight blue-green
08/04/06	9091982	A4	6	3	2	2	2	48	18								
08/07/07	9091982	A4	6	3		2				2	2	3	2				
09/25/07	9091982	A4	6	3										1			slight blue-green
08/04/06	9091982	A4	11	1	2	2	2	51	26								
08/07/07	9091982	A4	11	1		1				2	2	2	2		x early		
09/25/07	9091982	A4	11	1										1			
08/04/06	9091982	A4	11	2	2	2	2	48	27								
08/07/07	9091982	A4	11	2		1				2	2	2	2		x early		
09/25/07	9091982	A4	11	2										1			
08/04/06	9091982	A4	11	3	2	2	2	45	28								
08/07/07	9091982	A4	11	3		1				2	2	2	2		x early		
09/25/07	9091982	A4	11	3										1			
08/04/06	9091983	A5	1	1	2	1	1	45	31								blue
08/07/07	9091983	A5	1	1		1				2	2	2	1			x	blue
09/25/07	9091983	A5	1	1										1			blue
08/04/06	9091983	A5	1	2	2	1	1	42	36								blue
08/07/07	9091983	A5	1	2		1				2	2	2	1			x	blue
09/25/07	9091983	A5	1	2										1			blue
08/04/06	9091983	A5	1	3	2	1	1	45	36								blue
08/07/07	9091983	A5	1	3		1				2	2	2	1			x	
09/25/07	9091983	A5	1	3										1			blue
08/04/06	9091983	A5	7	1	2	1	2	36	24								blue, short
08/07/07	9091983	A5	7	1		2				2	2	2	1			x	blue

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
09/25/07	9091983	A5	7	1										1			blue, short
08/04/06	9091983	A5	7	2	2	1	2	42	29								blue, short
08/07/07	9091983	A5	7	2		2				2	2	2	1			x	blue
09/25/07	9091983	A5	7	2										1			blue, short
08/04/06	9091983	A5	7	3	2	1	2	42	31								blue, short
08/07/07	9091983	A5	7	3		2				2	2	2	1			x	blue
09/25/07	9091983	A5	7	3										1			blue, short
08/04/06	9091983	A5	12	1	3	1	1	39	37								blue
08/07/07	9091983	A5	12	1		2				2	2	2	1			x	blue
09/25/07	9091983	A5	12	1										1			blue, leafy at base
08/04/06	9091983	A5	12	2	3	1	1	39	38								blue
08/07/07	9091983	A5	12	2		2				2	2	2	1			x	blue
09/25/07	9091983	A5	12	2										1			blue, leafy at base
08/04/06	9091983	A5	12	3	3	1	1	39	40								blue
08/07/07	9091983	A5	12	3		2				2	2	2	1			x	blue
09/25/07	9091983	A5	12	3										1			blue, leafy at base
08/04/06	9091984	A6	1	1	2	2	2	48	36								
08/07/07	9091984	A6	1	1		2				2	2	2	2				
09/25/07	9091984	A6	1	1										1			
08/04/06	9091984	A6	1	2	2	2	2	51	37								
08/07/07	9091984	A6	1	2		2				2	2	2	2				
09/25/07	9091984	A6	1	2										1			
08/04/06	9091984	A6	1	3	2	2	2	51	33								
08/07/07	9091984	A6	1	3		2				2	2	2	2				
09/25/07	9091984	A6	1	3										1			
08/04/06	9091984	A6	9	1	2	2	2	45	33								
08/07/07	9091984	A6	9	1		2				2	2	2	2				
09/25/07	9091984	A6	9	1										1			prostrate, short
08/04/06	9091984	A6	9	2	2	2	2	42	32								
08/07/07	9091984	A6	9	2		2				2	2	2	2				
09/25/07	9091984	A6	9	2										1			prostrate, short
08/04/06	9091984	A6	9	3	2	2	2	42	38								
08/07/07	9091984	A6	9	3		2				2	2	2	2				
09/25/07	9091984	A6	9	3										1			prostrate, short

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/04/06	9091984	A6	10	1	2	2	3	45	35								
08/07/07	9091984	A6	10	1		2				2	2	1	2				
09/25/07	9091984	A6	10	1										1			
08/04/06	9091984	A6	10	2	2	2	3	48	34								
08/07/07	9091984	A6	10	2		2				2	2	2	2				
09/25/07	9091984	A6	10	2										1			a few red leaves
08/04/06	9091984	A6	10	3	2	3	3	36	21								boot
08/07/07	9091984	A6	10	3		2				2	2	2	2				
09/25/07	9091984	A6	10	3										1			a few red leaves
08/04/06	9091985	A7	1	1	2	1	2	39	23								
08/07/07	9091985	A7	1	1		1				2	1	2	2		x		
09/25/07	9091985	A7	1	1										1			
08/04/06	9091985	A7	1	2	2	1	2	45	17								
08/07/07	9091985	A7	1	2		1				2	1	2	2		x		
09/25/07	9091985	A7	1	2										1			
08/04/06	9091985	A7	1	3	2	1	2	45	20								
08/07/07	9091985	A7	1	3		1				2	1	2	2		x		
09/25/07	9091985	A7	1	3										1			
08/04/06	9091985	A7	9	1	2	2	2	33	24								boot
08/07/07	9091985	A7	9	1		1				2	2	2	2				
09/25/07	9091985	A7	9	1										1			small, fine leaf and stem
08/04/06	9091985	A7	9	2	2	2	2	39	27								boot
08/07/07	9091985	A7	9	2		1				2	2	2	2				
09/25/07	9091985	A7	9	2										1			small, fine leaf and stem
08/04/06	9091985	A7	9	3	2	2	2	39	31								
08/07/07	9091985	A7	9	3		1				2	2	2	2				
09/25/07	9091985	A7	9	3										1			small, fine leaf and stem
08/04/06	9091985	A7	11	1	dead												
08/07/07	9091985	A7	11	1						m				m			
09/25/07	9091985	A7	11	1													small, stressed
08/04/06	9091985	A7	11	2	2	1	2	45	25								
08/07/07	9091985	A7	11	2		1				2	2	2	2		x early		
09/25/07	9091985	A7	11	2										1			
08/04/06	9091985	A7	11	3	2	3	3	36	14								

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/07/07	9091985	A7	11	3		2				3	2	3	2				poor plant
09/25/07	9091985	A7	11	3										1			small, no heads
08/04/06	9091986	A8	1	1	2	2	2	51	27								
08/07/07	9091986	A8	1	1		2				2	2	1	2				stemmy, upright
09/25/07	9091986	A8	1	1										1			
08/04/06	9091986	A8	1	2	2	2	2	45	22								
08/07/07	9091986	A8	1	2		2				2	2	2	2				stemmy, upright
09/25/07	9091986	A8	1	2										1			
08/04/06	9091986	A8	1	3	2	2	2	45	20								
08/07/07	9091986	A8	1	3		2				2	2	2	2				stemmy, upright
09/25/07	9091986	A8	1	3										1			
08/04/06	9091986	A8	6	1	1	2	2	42	28								
08/07/07	9091986	A8	6	1		2				2	2	2	2				
09/25/07	9091986	A8	6	1										1			
08/04/06	9091986	A8	6	2	1	2	2	42	30								
08/07/07	9091986	A8	6	2		2				2	2	1	2				
09/25/07	9091986	A8	6	2										1			
08/04/06	9091986	A8	6	3	1	2	2	48	33								
08/07/07	9091986	A8	6	3		2				2	2	1	2				
09/25/07	9091986	A8	6	3										1			
08/04/06	9091986	A8	12	1	2	2	2	42	36								
08/07/07	9091986	A8	12	1		2				2	2	2	2				
09/25/07	9091986	A8	12	1										1			some red leaves
08/04/06	9091986	A8	12	2	2	2	2	42	36								
08/07/07	9091986	A8	12	2		2				2	2	2	2				
09/25/07	9091986	A8	12	2										1			some red leaves
08/04/06	9091986	A8	12	3	2	2	2	45	36								
08/07/07	9091986	A8	12	3		2				2	2	2	2				
09/25/07	9091986	A8	12	3										1			fine leaves
08/04/06	9091987	A9	1	1	2	1	1	39	27								
08/07/07	9091987	A9	1	1		1				2	2	2	2				
09/25/07	9091987	A9	1	1										1			
08/04/06	9091987	A9	1	2	2	1	1	42	25								
08/07/07	9091987	A9	1	2		1				2	2	2	2				

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
09/25/07	9091987	A9	1	2										1			
08/04/06	9091987	A9	1	3	2	1	1	39	21								
08/07/07	9091987	A9	1	3		1				2	2	2	2				
09/25/07	9091987	A9	1	3										1			
08/04/06	9091987	A9	7	1	2	2	1	42	30								
08/07/07	9091987	A9	7	1		2				2	2	3	2				
09/25/07	9091987	A9	7	1										1			fine leaves, few
08/04/06	9091987	A9	7	2	2	3	2	42	21								
08/07/07	9091987	A9	7	2		2				2	2	3	2				
09/25/07	9091987	A9	7	2										1			fine leaves, few
08/04/06	9091987	A9	7	3	2	2	1	45	35								
08/07/07	9091987	A9	7	3		2				2	2	2	2				
09/25/07	9091987	A9	7	3										1			fine leaves, few
08/04/06	9091987	A9	10	1	2	2	2	45	27								
08/07/07	9091987	A9	10	1		2				2	2	2	2				
09/25/07	9091987	A9	10	1										1			
08/04/06	9091987	A9	10	2	1	3	3	39	18								
08/07/07	9091987	A9	10	2		2				2	2	2	2				
09/25/07	9091987	A9	10	2										1			very small plant
08/04/06	9091987	A9	10	3	dead												
08/07/07	9091987	A9	10	3						m				m			
09/25/07	9091987	A9	10	3													very small plant
08/04/06	9091988	A10	2	1	1	2	2	42	16								
08/07/07	9091988	A10	2	1		3				2	1	3	2				
09/25/07	9091988	A10	2	1										2			
08/04/06	9091988	A10	2	2	1	2	1	48	25								
08/07/07	9091988	A10	2	2		1				2	1	2	2				
09/25/07	9091988	A10	2	2										1			
08/04/06	9091988	A10	2	3	1	2	1	54	22								
08/07/07	9091988	A10	2	3		1				2	1	1	2				
09/25/07	9091988	A10	2	3										1			
08/04/06	9091988	A10	8	1	2	1	2	51	24								
08/07/07	9091988	A10	8	1		1				2	2	2	2		x early		
09/25/07	9091988	A10	8	1										1			

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/04/06	9091988	A10	8	2	2	1	2	48	22								
08/07/07	9091988	A10	8	2		1				2	2	2	2		x early		
09/25/07	9091988	A10	8	2										1			
08/04/06	9091988	A10	8	3	2	1	2	54	23								
08/07/07	9091988	A10	8	3		1				2	2	2	2		x early		
09/25/07	9091988	A10	8	3										1			
08/04/06	9091988	A10	13	1	dead												
08/07/07	9091988	A10	13	1						m				m			
09/25/07	9091988	A10	13	1													red leaves
08/04/06	9091988	A10	13	2	2	1	2	45	21								
08/07/07	9091988	A10	13	2		1				2	2	2	2		x early		
09/25/07	9091988	A10	13	2										1			
08/04/06	9091989	A11	2	1	2	2	1	54	25								
08/07/07	9091989	A11	2	1		2				2	3	1	2				spreading, stemmy
09/25/07	9091989	A11	2	1										1			upright, thick stalk
08/04/06	9091989	A11	2	2	2	2	1	57	23								
08/07/07	9091989	A11	2	2		2				2	3	1	2				spreading, stemmy
09/25/07	9091989	A11	2	2										1			upright, thick stalk
08/04/06	9091989	A11	2	3	2	2	1	57	22								
08/07/07	9091989	A11	2	3		2				2	3	1	2				spreading, stemmy
09/25/07	9091989	A11	2	3										1			upright, thick stalk
08/04/06	9091989	A11	9	1	2	1	1	48	26								red
08/07/07	9091989	A11	9	1		1				2	2	1	2		x early		
09/25/07	9091989	A11	9	1										1			
08/04/06	9091989	A11	9	2	2	1	1	54	30								red
08/07/07	9091989	A11	9	2		1				2	2	1	2		x early		
09/25/07	9091989	A11	9	2										1			
08/04/06	9091989	A11	9	3	2	1	1	51	27								upright, dark
08/07/07	9091989	A11	9	3		1				2	2	1	2		x early		
09/25/07	9091989	A11	9	3										1			
08/04/06	9091989	A11	12	1	2	1	1	51	27								upright
08/07/07	9091989	A11	12	1		2				2	2	1	2				
09/25/07	9091989	A11	12	1										1			red on a few leaves
08/04/06	9091989	A11	12	2	2	1	1	48	27								upright

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08/07/07	9091989	A11	12	2		2				2	2	1	2				
09/25/07	9091989	A11	12	2										1			
08/04/06	9091989	A11	12	3	2	1	1	48	29								
08/07/07	9091989	A11	12	3		2				2	2	2	2				
09/25/07	9091989	A11	12	3										1			
08/04/06	9091990	A12	2	1	2	3	3	2	2								
08/07/07	9091990	A12	2	1						m				m			
09/25/07	9091990	A12	2	1													small, red leaves
08/04/06	9091990	A12	2	2	2	2	2	57	22								
08/07/07	9091990	A12	2	2		2				2	2	1	2		x		
09/25/07	9091990	A12	2	2										1			
08/04/06	9091990	A12	2	3	2	2	2	51	25								
08/07/07	9091990	A12	2	3		2				2	2	2	2				
09/25/07	9091990	A12	2	3										1			
08/04/06	9091990	A12	8	1	dead												
08/07/07	9091990	A12	8	1						m				m			
09/25/07	9091990	A12	8	1													red leaves
08/04/06	9091990	A12	8	2	2	1	1	54	21								
08/07/07	9091990	A12	8	2		1				2	2	2	2		x early		
09/25/07	9091990	A12	8	2										1			
08/04/06	9091990	A12	8	3	2	1	1	54	27								
08/07/07	9091990	A12	8	3		1				2	2	2	2		x early		
09/25/07	9091990	A12	8	3										1			
08/04/06	9091990	A12	11	1	2	1	2	51	26								dark gray
08/07/07	9091990	A12	11	1		1				2	2	1	1		x early	x	unique color
09/25/07	9091990	A12	11	1										1			
08/04/06	9091990	A12	11	2	2	1	2	51	23								dark gray
08/07/07	9091990	A12	11	2		1				2	2	1	1		x early	x	unique color
09/25/07	9091990	A12	11	2										1			
08/04/06	9091990	A12	11	3	2	1	2	51	22								
08/07/07	9091990	A12	11	3		1				2	2	1	1		x early	x	unique color
09/25/07	9091990	A12	11	3										1			leaves basal
08/04/06	9091991	Y1	2	1	3	2	3	42	20								boot, red
08/07/07	9091991	Y1	2	1		1				3	1	1	2				red tips on leaves

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
09/25/07	9091991	Y1	2	1										3			red variegated
08/04/06	9091991	Y1	2	2	3	2	3	36	26								boot, red
08/07/07	9091991	Y1	2	2		1				3	1	1	2				red tips on leaves
09/25/07	9091991	Y1	2	2										3			red variegated
08/04/06	9091991	Y1	2	3	3	2	3	39	25								boot
08/07/07	9091991	Y1	2	3		1				3	1	1	2				red tips on leaves
09/25/07	9091991	Y1	2	3										3			red variegated
08/04/06	9091991	Y1	6	1	3	3	3	24	15								boot, red
08/07/07	9091991	Y1	6	1		2				3	2	3	1				red leaves
09/25/07	9091991	Y1	6	1										3			small, red
08/04/06	9091991	Y1	6	2	3	2	3	27	24								boot, red
08/07/07	9091991	Y1	6	2		2				3	2	2	1				red leaves
09/25/07	9091991	Y1	6	2										3			small, red
08/04/06	9091991	Y1	6	3	3	2	3	36	24								boot, red
08/07/07	9091991	Y1	6	3		2				3	2	2	1				red leaves
09/25/07	9091991	Y1	6	3										3			small, red
08/04/06	9091991	Y1	13	1	3	2	3	33	13								red, boot
08/07/07	9091991	Y1	13	1		2				3	2	3	1				red leaves
09/25/07	9091991	Y1	13	1										3			red leaves
08/04/06	9091991	Y1	13	2	dead												
08/07/07	9091991	Y1	13	2						m				m			
09/25/07	9091991	Y1	13	2													
08/04/06	9091992	Y2	2	1	2	1	3	42	27								boot
08/07/07	9091992	Y2	2	1		1				3	1	1	2				leafy
09/25/07	9091992	Y2	2	1										3			
08/04/06	9091992	Y2	2	2	2	1	3	42	22								boot
08/07/07	9091992	Y2	2	2		1				3	1	1	2				leafy
09/25/07	9091992	Y2	2	2										3			
08/04/06	9091992	Y2	2	3	2	1	3	48	23								boot
08/07/07	9091992	Y2	2	3		1				3	1	1	2				leafy
09/25/07	9091992	Y2	2	3										3			
08/04/06	9091992	Y2	8	1	2	1	3	39	28								boot, early
08/07/07	9091992	Y2	8	1		1				3	2	1	2				
09/25/07	9091992	Y2	8	1										3			

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/04/06	9091992	Y2	8	2	2	1	3	39	22								boot, early
08/07/07	9091992	Y2	8	2		1				3	2	1	2				
09/25/07	9091992	Y2	8	2										3			
08/04/06	9091992	Y2	8	3	2	1	3	42	21								boot, early
08/07/07	9091992	Y2	8	3		1				3	2	1	2				
09/25/07	9091992	Y2	8	3										3			
08/04/06	9091992	Y2	10	1	3	1	2	39	22								boot
08/07/07	9091992	Y2	10	1		1				3	1	1	2		x late		
09/25/07	9091992	Y2	10	1										2			
08/04/06	9091992	Y2	10	2	3	1	2	39	23								boot
08/07/07	9091992	Y2	10	2		1				3	1	1	2				
09/25/07	9091992	Y2	10	2										2			
08/04/06	9091992	Y2	10	3	dead												
08/07/07	9091992	Y2	10	3						m				m			
09/25/07	9091992	Y2	10	3													
08/04/06	9091993	Y3	2	1	3	1	3	42	16								boot
08/07/07	9091993	Y3	2	1		1				3	1	1	2				upright
09/25/07	9091993	Y3	2	1										1			
08/04/06	9091993	Y3	2	2	3	1	3	42	19								boot
08/07/07	9091993	Y3	2	2		1				3	1	1	2				
09/25/07	9091993	Y3	2	2										1			
08/04/06	9091993	Y3	2	3	3	1	3	42	22								
08/07/07	9091993	Y3	2	3		1				3	1	1	2				
09/25/07	9091993	Y3	2	3										1			
08/04/06	9091993	Y3	6	1	3	1	2	45	30								boot
08/07/07	9091993	Y3	6	1		1				3	1	1	2				
09/25/07	9091993	Y3	6	1										2			
08/04/06	9091993	Y3	6	2	3	1	2	36	24								boot
08/07/07	9091993	Y3	6	2		1				3	1	1	2				
09/25/07	9091993	Y3	6	2										2			
08/04/06	9091993	Y3	6	3	3	1	2	42	28								boot
08/07/07	9091993	Y3	6	3		1				3	1	1	2				
09/25/07	9091993	Y3	6	3										2			
08/04/06	9091993	Y3	11	1	3	1	2	42	20								boot

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/07/07	9091993	Y3	11	1		1				3	1	1	2				
09/25/07	9091993	Y3	11	1										2			upright
08/04/06	9091993	Y3	11	2	3	1	2	39	18								
08/07/07	9091993	Y3	11	2		1				3	1	1	2				boot
09/25/07	9091993	Y3	11	2										2			upright
08/04/06	9091993	Y3	11	3	3	1	2	39	16								boot
08/07/07	9091993	Y3	11	3		1				3	1	1	2		x late		
09/25/07	9091993	Y3	11	3										2			upright
08/04/06	9091994	Y4	2	1	3	1	3	42	25								boot
08/07/07	9091994	Y4	2	1		1				3	1	1	1				blue, purple leaves
09/25/07	9091994	Y4	2	1										3			blue
08/04/06	9091994	Y4	2	2	3	1	3	42	22								boot
08/07/07	9091994	Y4	2	2		1				3	1	1	1				blue, purple leaves
09/25/07	9091994	Y4	2	2										3			blue
08/04/06	9091994	Y4	2	3	3	1	3	42	22								boot
08/07/07	9091994	Y4	2	3		1				3	1	1	1				blue, purple leaves
09/25/07	9091994	Y4	2	3										3			blue
08/04/06	9091994	Y4	9	1	3	2	2	42	36								blue, boot
08/07/07	9091994	Y4	9	1		1				3	1	1	1		x late		blue
09/25/07	9091994	Y4	9	1										3			blue
08/04/06	9091994	Y4	9	2	dead												
08/07/07	9091994	Y4	9	2						m				m			
09/25/07	9091994	Y4	9	2													
08/04/06	9091994	Y4	9	3	3	2	2	42	37								blue, boot
08/07/07	9091994	Y4	9	3		1				3	1	1	1		x late		blue
09/25/07	9091994	Y4	9	3										3			blue
08/04/06	9091994	Y4	13	1	3	1	2	48	18								boot, blue
08/07/07	9091994	Y4	13	1		1				3	1	1	1		x late		
09/25/07	9091994	Y4	13	1										2			blue
08/04/06	9091995	Y5	2	1	2	2	2	45	18								
08/07/07	9091995	Y5	2	1		2				2	2	2	2				
09/25/07	9091995	Y5	2	1										1			
08/04/06	9091995	Y5	2	2	2	2	2	51	21								
08/07/07	9091995	Y5	2	2		2				2	2	1	2				

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
09/25/07	9091995	Y5	2	2										1			
08/04/06	9091995	Y5	2	3	2	2	2	54	22								
08/07/07	9091995	Y5	2	3		2				2	2	2	2				
09/25/07	9091995	Y5	2	3										1			
08/04/06	9091995	Y5	9	1	3	2	2	45	25								boot+
08/07/07	9091995	Y5	9	1		2				2	2	1	2		x early		
09/25/07	9091995	Y5	9	1										1			
08/04/06	9091995	Y5	9	2	3	2	2	45	28								
08/07/07	9091995	Y5	9	2		2				2	2	1	2		x early		
09/25/07	9091995	Y5	9	2										1			
08/04/06	9091995	Y5	9	3	3	2	2	48	27								
08/07/07	9091995	Y5	9	3		2				2	2	1	2		x early		
09/25/07	9091995	Y5	9	3										1			
08/04/06	9091995	Y5	11	1	2	1	2	48	25								
08/07/07	9091995	Y5	11	1		2				2	2	1	2		x early		
09/25/07	9091995	Y5	11	1										1			slight blue-green
08/04/06	9091995	Y5	11	2	2	1	2	51	22								
08/07/07	9091995	Y5	11	2		2				2	2	1	2		x early		
09/25/07	9091995	Y5	11	2										1			slight blue-green
08/04/06	9091995	Y5	11	3	2	1	2	48	28								
08/07/07	9091995	Y5	11	3		2				2	2	1	2		x early		
09/25/07	9091995	Y5	11	3										1			slight blue-green
08/04/06	9091996	Y6	2	1	3	1	3	36	22								boot
08/07/07	9091996	Y6	2	1		1				3	1	1	2				
09/25/07	9091996	Y6	2	1										3			
08/04/06	9091996	Y6	2	2	3	1	3	33	25								boot
08/07/07	9091996	Y6	2	2		1				3	1	1	2				
09/25/07	9091996	Y6	2	2										3			
08/04/06	9091996	Y6	2	3	3	1	3	36	25								boot
08/07/07	9091996	Y6	2	3		1				3	1	1	2				
09/25/07	9091996	Y6	2	3										3			
08/04/06	9091996	Y6	8	1	3	1	3	33	37								boot
08/07/07	9091996	Y6	8	1		1				3	2	1	2		x late		
09/25/07	9091996	Y6	8	1										3			blue-green

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/04/06	9091996	Y6	8	2	3	1	3	30	32								boot
08/07/07	9091996	Y6	8	2		1				3	2	1	2				
09/25/07	9091996	Y6	8	2										3			blue-green
08/04/06	9091996	Y6	8	3	3	1	3	33	33								boot
08/07/07	9091996	Y6	8	3		1				3	2	1	2				
09/25/07	9091996	Y6	8	3										3			blue-green
08/04/06	9091996	Y6	13	1	3	1	2	33	24								boot
08/07/07	9091996	Y6	13	1		1				3	2	1	2		x late		leafy
09/25/07	9091996	Y6	13	1										2			blue, red leaves
08/04/06	9091996	Y6	13	2	dead												
08/07/07	9091996	Y6	13	2						m				m			
09/25/07	9091996	Y6	13	2													
08/04/06	9091997	Y7	3	1	3	1	3	54	27								boot
08/07/07	9091997	Y7	3	1		1				3	2	1	2		x late		
09/25/07	9091997	Y7	3	1										3			
08/04/06	9091997	Y7	3	2	3	1	3	51	30								boot
08/07/07	9091997	Y7	3	2		1				3	2	1	2		x late		
09/25/07	9091997	Y7	3	2										3			
08/04/06	9091997	Y7	3	3	3	1	3	51	34								boot
08/07/07	9091997	Y7	3	3		1				3	2	1	2		x late		
09/25/07	9091997	Y7	3	3										3			
08/04/06	9091997	Y7	7	1	3	1	1	54	32								boot
08/07/07	9091997	Y7	7	1		1				3	2	1	2		x late		
09/25/07	9091997	Y7	7	1										2			upright, leafy
08/04/06	9091997	Y7	7	2	3	1	1	54	33								boot
08/07/07	9091997	Y7	7	2		1				3	2	1	2		x late		
09/25/07	9091997	Y7	7	2										2			upright, leafy
08/04/06	9091997	Y7	7	3	3	1	1	54	29								boot
08/07/07	9091997	Y7	7	3		1				3	2	1	2		x late		
09/25/07	9091997	Y7	7	3										2			upright, leafy
08/04/06	9091997	Y7	10	1	3	1	2	51	20								boot
08/07/07	9091997	Y7	10	1		1				3	1	1	2		x late		big plant
09/25/07	9091997	Y7	10	1										3			upright
08/04/06	9091997	Y7	10	2	3	1	2	51	18								boot

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08/07/07	9091997	Y7	10	2		1				3	1	1	2		x late		
09/25/07	9091997	Y7	10	2										3			upright
08/04/06	9091997	Y7	10	3	3	1	2	51	24								boot
08/07/07	9091997	Y7	10	3		1				3	1	1	2		x late		
09/25/07	9091997	Y7	10	3										3			upright
08/04/06	9091998	Y8	3	1	3	1	3	48	33								boot
08/07/07	9091998	Y8	3	1		1				3	2	1	1				coarse leaves
09/25/07	9091998	Y8	3	1										3			blue
08/04/06	9091998	Y8	3	2	dead												
08/07/07	9091998	Y8	3	2						m				m			
09/25/07	9091998	Y8	3	2													very tiny 1"-2"
08/04/06	9091998	Y8	3	3	3	1	3	51	37								boot
08/07/07	9091998	Y8	3	3		1				3	2	1	1				coarse leaves
09/25/07	9091998	Y8	3	3										2			blue
08/04/06	9091998	Y8	8	1	3	1	2	45	26								boot, blue
08/07/07	9091998	Y8	8	1		1				3	1	1	1		x late		coarse
09/25/07	9091998	Y8	8	1										2			blue
08/04/06	9091998	Y8	8	2	3	1	2	45	29								boot, blue
08/07/07	9091998	Y8	8	2		1				3	1	1	1		x late		coarse
09/25/07	9091998	Y8	8	2										2			blue
08/04/06	9091998	Y8	8	3	dead												
08/07/07	9091998	Y8	8	3						m				m			
09/25/07	9091998	Y8	8	3													
08/04/06	9091998	Y8	13	1	3	1	2	48	24								blue upright
08/07/07	9091998	Y8	13	1		1				3	1	1	1		x late		
09/25/07	9091998	Y8	13	1										2			blue
08/04/06	9091999	Y9	3	1	3	1	3	48	28								boot
08/07/07	9091999	Y9	3	1		1				3	1	1	1				blue
09/25/07	9091999	Y9	3	1										2			blue
08/04/06	9091999	Y9	3	2	3	1	3	51	33								boot
08/07/07	9091999	Y9	3	2		1				3	1	1	1				blue
09/25/07	9091999	Y9	3	2										3			blue
08/04/06	9091999	Y9	3	3	3	1	3	45	28								boot
08/07/07	9091999	Y9	3	3		1				3	1	1	1		x	x	blue

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09/25/07	9091999	Y9	3	3										3			blue
08/04/06	9091999	Y9	7	1	dead												
08/07/07	9091999	Y9	7	1						m				m			
09/25/07	9091999	Y9	7	1													
08/04/06	9091999	Y9	7	2	3	1	2	48	29								boot, blue
08/07/07	9091999	Y9	7	2		1				3	1	1	1		x late		
09/25/07	9091999	Y9	7	2										3			blue upright
08/04/06	9091999	Y9	7	3	dead												
08/07/07	9091999	Y9	7	3						m				m			
09/25/07	9091999	Y9	7	3													
08/04/06	9091999	Y9	13	1	3	2	2	51	17								blue
08/07/07	9091999	Y9	13	1		1				3	1	1	1		x late		upright, blue
09/25/07	9091999	Y9	13	1										3			blue
08/04/06	9092000	Y10	3	1	3	1	3	39	36								boot
08/07/07	9092000	Y10	3	1		1				3	2	1	2		x late		
09/25/07	9092000	Y10	3	1										3			
08/04/06	9092000	Y10	3	2	3	1	3	36	33								boot
08/07/07	9092000	Y10	3	2		1				3	2	1	2		x late		
09/25/07	9092000	Y10	3	2										3			
08/04/06	9092000	Y10	3	3	3	1	3	33	28								boot
08/07/07	9092000	Y10	3	3		1				3	2	1	2		x late		
09/25/07	9092000	Y10	3	3										3			
08/04/06	9092001	Y11	3	1	2	3	3	12	15								
08/07/07	9092001	Y11	3	1		2				3	1	3	2				poor plant
09/25/07	9092001	Y11	3	1										3			light gold seed
08/04/06	9092001	Y11	3	2	3	1	1	45	23								boot
08/07/07	9092001	Y11	3	2		2				3	1	2	2				variegated
09/25/07	9092001	Y11	3	2										3			light gold seed
08/04/06	9092002	Y12	3	1	3	2	2	45	25								
08/07/07	9092002	Y12	3	1		2				2	1	1	1		x		
09/25/07	9092002	Y12	3	1										1			
08/04/06	9092002	Y12	3	2	3	2	2	48	25								
08/07/07	9092002	Y12	3	2		2				2	1	1	1			x	
09/25/07	9092002	Y12	3	2										1			

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/04/06	9092003	Y13	3	1	3	2	3	30	31								boot
08/07/07	9092003	Y13	3	1		1				3	2	1	2			x	
09/25/07	9092003	Y13	3	1										2			prostrate, small
08/04/06	9092003	Y13	3	2	x												boot
08/07/07	9092003	Y13	3	2						m				m			
09/25/07	9092003	Y13	3	2													prostrate, small
08/04/06	9092003	Y13	3	3	3	1	2	45	38								boot
08/07/07	9092003	Y13	3	3		1				3	2	1	2				
09/25/07	9092003	Y13	3	3										2			open crown
08/04/06	9092004	Y14	3	1	3	1	3	51	29								boot
08/07/07	9092004	Y14	3	1		1				2	2	1	2				
09/25/07	9092004	Y14	3	1										2			yellow-green leaves
08/04/06	9092004	Y14	3	2	3	1	3	45	25								boot
08/07/07	9092004	Y14	3	2		1				2	2	1	2				
09/25/07	9092004	Y14	3	2										2			yellow-green leaves
08/04/06	9092004	Y14	3	3	3	1	3	45	27								boot
08/07/07	9092004	Y14	3	3		1				2	2	1	2				
09/25/07	9092004	Y14	3	3										2			yellow-green leaves
08/04/06	9092004	Y14	9	1	3	1	2	45	29								
08/07/07	9092004	Y14	9	1		1				3	2	1	2				
09/25/07	9092004	Y14	9	1										2			
08/04/06	9092004	Y14	9	2	3	1	2	45	26								boot
08/07/07	9092004	Y14	9	2		1				3	2	1	2				
09/25/07	9092004	Y14	9	2										2			
08/04/06	9092004	Y14	9	3	3	1	2	45	22								boot
08/07/07	9092004	Y14	9	3		1				3	2	1	2				
09/25/07	9092004	Y14	9	3										2			
08/04/06	9092004	Y14	10	1	3	1	2	48	24								boot
08/07/07	9092004	Y14	10	1		1				3	1	1	2		x late		
09/25/07	9092004	Y14	10	1										2			
08/04/06	9092004	Y14	10	2	3	1	2	48	26								boot
08/07/07	9092004	Y14	10	2		1				3	1	1	2		x late		
09/25/07	9092004	Y14	10	2										2			
08/04/06	9092004	Y14	10	3	3	1	2	48	26								boot

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/07/07	9092004	Y14	10	3		1				3	1	1	2		x late		
09/25/07	9092004	Y14	10	3										2			
08/04/06	9092005	L1	3	1	3	1	3	39	28								boot
08/07/07	9092005	L1	3	1		2				2	2	1	2				
09/25/07	9092005	L1	3	1										1			
08/04/06	9092005	L1	3	2	3	1	3	45	24								boot
08/07/07	9092005	L1	3	2		2				2	2	1	2				
09/25/07	9092005	L1	3	2										1			
08/04/06	9092005	L1	3	3	3	1	3	45	24								boot
08/07/07	9092005	L1	3	3		2				2	2	1	2				
09/25/07	9092005	L1	3	3										1			
08/04/06	9092005	L1	9	1	3	1	2	48	30								boot
08/07/07	9092005	L1	9	1		2				2	2	1	2				
09/25/07	9092005	L1	9	1										2			
08/04/06	9092005	L1	9	2	3	1	2	42	32								boot
08/07/07	9092005	L1	9	2		2				2	2	1	2				
09/25/07	9092005	L1	9	2										2			
08/04/06	9092005	L1	9	3	3	1	2	42	33								boot
08/07/07	9092005	L1	9	3		2				2	2	1	2				
09/25/07	9092005	L1	9	3										2			
08/04/06	9092005	L1	13	1	3	1	1	48	35								upright
08/07/07	9092005	L1	13	1		2				2	2	1	1				
09/25/07	9092005	L1	13	1										2			
08/04/06	9092006	L2	4	1	2	1	2	36	32								boot
08/07/07	9092006	L2	4	1		1				3	2	2	2				
09/25/07	9092006	L2	4	1										1			light colored heads
08/04/06	9092006	L2	4	2	2	1	2	39	34								boot
08/07/07	9092006	L2	4	2		1				3	2	1	2				
09/25/07	9092006	L2	4	2										1			light colored heads
08/04/06	9092006	L2	4	3	2	1	2	39	32								boot
08/07/07	9092006	L2	4	3		1				3	2	1	2				
09/25/07	9092006	L2	4	3										1			light colored heads
08/04/06	9092006	L2	6	1	3	1	2	42	34								boot
08/07/07	9092006	L2	6	1		1				3	1	1	2		x late		

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
09/25/07	9092006	L2	6	1										1			slight blue-green
08/04/06	9092006	L2	6	2	3	1	2	39	30								boot
08/07/07	9092006	L2	6	2		1				3	1	1	2		x late		
09/25/07	9092006	L2	6	2										1			slight blue-green
08/04/06	9092006	L2	6	3	3	1	2	36	33								boot
08/07/07	9092006	L2	6	3		1				3	1	1	2		x late		
09/25/07	9092006	L2	6	3										1			slight blue-green
08/04/06	9092006	L2	13	1	2	1	2	39	22								boot
08/07/07	9092006	L2	13	1		1				3	2	1	2		x late		
09/25/07	9092006	L2	13	1										1			blue-green, leafy
08/04/06	9092006	L2	13	2	2	1	2	36	23								boot
08/07/07	9092006	L2	13	2		1				3	2	1	2		x late		
09/25/07	9092006	L2	13	2										1			blue-green, leafy
08/04/06	9092007	L3	4	1	2	1	2	39	33								boot
08/07/07	9092007	L3	4	1		2				2	2	1	2				
09/25/07	9092007	L3	4	1										2			
08/04/06	9092007	L3	4	2	2	1	2	39	33								boot
08/07/07	9092007	L3	4	2		2				2	2	1	2				
09/25/07	9092007	L3	4	2										2			
08/04/06	9092007	L3	4	3	2	1	2	45	38								boot
08/07/07	9092007	L3	4	3		2				2	2	1	2				
09/25/07	9092007	L3	4	3										1			
08/04/06	9092007	L3	7	1	2	1	2	30	29								boot
08/07/07	9092007	L3	7	1		2				2	2	2	2				
09/25/07	9092007	L3	7	1										1			very fine leaf, leafy
08/04/06	9092007	L3	7	2	2	1	2	33	27								boot
08/07/07	9092007	L3	7	2		2				2	2	2	2				
09/25/07	9092007	L3	7	2										1			very fine leaf, leafy
08/04/06	9092007	L3	7	3	2	1	2	27	29								boot
08/07/07	9092007	L3	7	3		2				2	2	2	2				
09/25/07	9092007	L3	7	3										1			very fine leaf, leafy
08/04/06	9092007	L3	12	1	3	1	2	39	30								boot
08/07/07	9092007	L3	12	1		2				2	2	2	2				
09/25/07	9092007	L3	12	1										1			upright, leafy

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/04/06	9092007	L3	12	2	3	1	2	42	28								
08/07/07	9092007	L3	12	2		2				2	2	2	2				
09/25/07	9092007	L3	12	2										1			upright, leafy
08/04/06	9092007	L3	12	3	3	1	2	42	26								
08/07/07	9092007	L3	12	3		2				2	2	2	2				
09/25/07	9092007	L3	12	3										1			upright, leafy
08/04/06	9092008	K1	4	1	2	2	2	54	35								
08/07/07	9092008	K1	4	1		1				2	2	1	2		x		
09/25/07	9092008	K1	4	1										1			
08/04/06	9092008	K1	4	2	2	2	2	54	28								
08/07/07	9092008	K1	4	2		1				2	2	1	2		x		
09/25/07	9092008	K1	4	2										1			
08/04/06	9092008	K1	4	3	2	2	2	51	34								
08/07/07	9092008	K1	4	3		1				2	2	1	2		x		
09/25/07	9092008	K1	4	3										1			
08/04/06	9092008	K1	6	1	2	1	2	57	36								
08/07/07	9092008	K1	6	1		2				2	2	2	2				
09/25/07	9092008	K1	6	1										1			
08/04/06	9092008	K1	6	2	2	1	2	54	34								
08/07/07	9092008	K1	6	2		2				2	2	1	2				
09/25/07	9092008	K1	6	2										1			
08/04/06	9092008	K1	6	3	2	1	2	54	31								
08/07/07	9092008	K1	6	3		2				2	2	3	2				
09/25/07	9092008	K1	6	3										1			
08/04/06	9092008	K1	13	1	1	2	2	51	27								
08/07/07	9092008	K1	13	1		1				2	2	1	1		x early		
09/25/07	9092008	K1	13	1										1			
08/04/06	9092009	P1	4	1	3	1	3	33	37								boot
08/07/07	9092009	P1	4	1		1				2	2	1	2		x		
09/25/07	9092009	P1	4	1										1			
08/04/06	9092009	P1	4	2	3	1	3	39	39								boot
08/07/07	9092009	P1	4	2		1				2	2	1	2		x		
09/25/07	9092009	P1	4	2										1			
08/04/06	9092009	P1	4	3	3	1	3	30	37								boot

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/07/07	9092009	P1	4	3		1				2	2	1	2		x		
09/25/07	9092009	P1	4	3										2			
08/04/06	9092009	P1	8	1	3	1	2	30	39								boot
08/07/07	9092009	P1	8	1		2				3	2	1	2		x late		
09/25/07	9092009	P1	8	1										1			
08/04/06	9092009	P1	8	2	3	1	2	30	28								boot
08/07/07	9092009	P1	8	2		2				3	2	1	2		x late		
09/25/07	9092009	P1	8	2										1			slight blue-green
08/04/06	9092009	P1	8	3	3	1	2	30	32								boot
08/07/07	9092009	P1	8	3		2				3	2	1	2		x late		
09/25/07	9092009	P1	8	3										1			
08/04/06	9092009	P1	11	1	3	1	2	42	27								boot
08/07/07	9092009	P1	11	1		1				3	2	1	2		x		
09/25/07	9092009	P1	11	1										2			
08/04/06	9092009	P1	11	2	3	1	2	39	30								boot
08/07/07	9092009	P1	11	2		1				3	2	1	2		x		
09/25/07	9092009	P1	11	2										2			
08/04/06	9092009	P1	11	3	1	3	3										
08/07/07	9092009	P1	11	3		3				2	2	3	2		x		
09/25/07	9092009	P1	11	3										3			
08/04/06	9092010	P2	4	1	3	2	3	39	33								boot
08/07/07	9092010	P2	4	1		2				3	2	2	2				
09/25/07	9092010	P2	4	1										2			
08/04/06	9092010	P2	4	2	3	2	3	39	26								boot
08/07/07	9092010	P2	4	2		2				3	2	2	2				
09/25/07	9092010	P2	4	2										2			
08/04/06	9092010	P2	4	3	littleblue												little bluestem
08/07/07	9092010	P2	4	3						little blue				lbs			little bluestem
09/25/07	9092010	P2	4	3													little bluestem
08/04/06	9092010	P2	10	1	3	2	2	36	29								boot
08/07/07	9092010	P2	10	1		1				1	2	1	2				
09/25/07	9092010	P2	10	1										2			
08/04/06	9092011	E1	4	1	2	2	1	63	18								
08/07/07	9092011	E1	4	1		2				2	2	2	2				

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
09/25/07	9092011	E1	4	1										1			
08/04/06	9092011	E1	4	2	2	2	1	60	19								
08/07/07	9092011	E1	4	2		2				2	2	2	2				
09/25/07	9092011	E1	4	2										1			
08/04/06	9092011	E1	4	3	2	2	1	57	21								
08/07/07	9092011	E1	4	3		2				2	2	2	2				
09/25/07	9092011	E1	4	3										1			
08/04/06	9092011	E1	6	1	1	1	2	60	26								
08/07/07	9092011	E1	6	1		2				2	2	2	2				
09/25/07	9092011	E1	6	1										1			
08/04/06	9092011	E1	6	2	1	1	2	60	22								
08/07/07	9092011	E1	6	2		1				1	2	1	2		x		fine heads
09/25/07	9092011	E1	6	2										1			
08/04/06	9092011	E1	6	3	1	1	2	57	21								
08/07/07	9092011	E1	6	3		2				2	2	2	2				
09/25/07	9092011	E1	6	3										1			
08/04/06	9092011	E1	13	1	2	2	2	57	18								
08/07/07	9092011	E1	13	1		2				2	1	2	2				
09/25/07	9092011	E1	13	1										1			
08/04/06	9092012	E2	4	1	3	2	2	66	25								
08/07/07	9092012	E2	4	1		1				2	2	1	2		x		upright
09/25/07	9092012	E2	4	1										1			
08/04/06	9092012	E2	4	2	3	2	2	66	18								
08/07/07	9092012	E2	4	2		1				2	2	1	2		x		upright
09/25/07	9092012	E2	4	2										1			
08/04/06	9092012	E2	4	3	3	2	2	66	20								
08/07/07	9092012	E2	4	3		1				2	2	1	2		x		upright
09/25/07	9092012	E2	4	3										1			
08/04/06	9092012	E2	8	1	2	1	1	63	29								
08/07/07	9092012	E2	8	1		1				1	2	1	2		x early		
09/25/07	9092012	E2	8	1										1			
08/04/06	9092012	E2	8	2	2	1	1	66	23								
08/07/07	9092012	E2	8	2		1				1	2	1	2		x early		
09/25/07	9092012	E2	8	2										1			

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/04/06	9092012	E2	8	3	2	1	1	63	24								
08/07/07	9092012	E2	8	3		1				1	2	1	2		x early		
09/25/07	9092012	E2	8	3										1			
08/04/06	9092012	E2	12	1	2	1	1	63	17								upright
08/07/07	9092012	E2	12	1		1				1	1	1	2		x early		
09/25/07	9092012	E2	12	1										1			upright
08/04/06	9092012	E2	12	2	2	1	1	63	19								
08/07/07	9092012	E2	12	2		1				1	1	1	2		x early		upright
09/25/07	9092012	E2	12	2										1			
08/04/06	9092012	E2	12	3	2	1	1	63	18								
08/07/07	9092012	E2	12	3		1				1	1	1	2		x early		upright
09/25/07	9092012	E2	12	3										1			
08/04/06	9092013	E3	4	1	2	2	2	63	32								
08/07/07	9092013	E3	4	1		2				1	2	1	2				early maturing, coarse
09/25/07	9092013	E3	4	1										1			
08/04/06	9092013	E3	4	2	2	2	2	60	21								
08/07/07	9092013	E3	4	2		2				2	2	2	2				
09/25/07	9092013	E3	4	2										1			
08/04/06	9092013	E3	4	3	2	2	2	54	18								
08/07/07	9092013	E3	4	3		2				2	2	2	2				
09/25/07	9092013	E3	4	3										1			small plant
08/04/06	9092013	E3	6	1	2	2	2	63	29								
08/07/07	9092013	E3	6	1		3				1	1	1	2				stemmy
09/25/07	9092013	E3	6	1										1			small, not leafy
08/04/06	9092013	E3	6	2	2	2	2	63	23								
08/07/07	9092013	E3	6	2		3				1	1	1	2				stemmy
09/25/07	9092013	E3	6	2										1			small, not leafy
08/04/06	9092013	E3	6	3	2	2	2	60	20								
08/07/07	9092013	E3	6	3		3				1	1	1	2				stemmy
09/25/07	9092013	E3	6	3										1			small, not leafy
08/04/06	9092013	E3	12	1	3	2	2	60	25								
08/07/07	9092013	E3	12	1		2				2	2	1	2				
09/25/07	9092013	E3	12	1										1			few leaves
08/04/06	9092013	E3	12	2	3	2	2	60	24								

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/07/07	9092013	E3	12	2		2				2	2	1	2				
09/25/07	9092013	E3	12	2										1			few leaves
08/04/06	9092013	E3	12	3	3	2	2	63	22								
08/07/07	9092013	E3	12	3		2				2	2	1	2				
09/25/07	9092013	E3	12	3										1			few leaves
08/04/06	9092014	Tom1	5	1	1	2	1	42	24								
08/07/07	9092014	Tom1	5	1		2				1	2	2	2				
09/25/07	9092014	Tom1	5	1										1			slight blue-green
08/04/06	9092014	Tom1	5	2	1	2	1	45	34								
08/07/07	9092014	Tom1	5	2		2				1	2	2	2				
09/25/07	9092014	Tom1	5	2										1			
08/04/06	9092014	Tom1	5	3	1	2	1	45	33								
08/07/07	9092014	Tom1	5	3		2				1	2	2	2				
09/25/07	9092014	Tom1	5	3										1			
08/04/06	9092014	Tom1	9	1	dead												
08/07/07	9092014	Tom1	9	1						m				m			
09/25/07	9092014	Tom1	9	1													
08/04/06	9092014	Tom1	9	2	2	2	1	45	31								
08/07/07	9092014	Tom1	9	2		2				1	2	2	2				
09/25/07	9092014	Tom1	9	2										1			prostrate, short
08/04/06	9092014	Tom1	9	3	2	2	1	42	29								
08/07/07	9092014	Tom1	9	3		2				1	2	2	2				
09/25/07	9092014	Tom1	9	3										1			prostrate, short
08/04/06	9092014	Tom1	12	1	1	2	1	45	36								
08/07/07	9092014	Tom1	12	1		2				1	2	2	2				
09/25/07	9092014	Tom1	12	1										1			blue-green, fine
08/04/06	9092014	Tom1	12	2	1	2	1	42	36								
08/07/07	9092014	Tom1	12	2		2				1	2	2	2				
09/25/07	9092014	Tom1	12	2										1			blue-green, fine
08/04/06	9092014	Tom1	12	3	1	2	1	42	34								
08/07/07	9092014	Tom1	12	3		2				1	2	2	2				
09/25/07	9092014	Tom1	12	3										1			blue-green, fine
08/04/06	9092015	Tom2	5	1	2	2	1	48	29								
08/07/07	9092015	Tom2	5	1		2				1	2	2	2				

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
09/25/07	9092015	Tom2	5	1										1			
08/04/06	9092015	Tom2	5	2	2	2	1	48	30								
08/07/07	9092015	Tom2	5	2		2				1	2	2	2				
09/25/07	9092015	Tom2	5	2										1			blue-green
08/04/06	9092015	Tom2	5	3	3	1	1	60	36								very upright
08/07/07	9092015	Tom2	5	3		2				2	2	1	1				coarse leaves
09/25/07	9092015	Tom2	5	3										1			
08/04/06	9092015	Tom2	6	1	2	2	1	48	34								
08/07/07	9092015	Tom2	6	1		2				1	2	2	2				
09/25/07	9092015	Tom2	6	1										1			
08/04/06	9092015	Tom2	6	2	2	2	1	45	26								
08/07/07	9092015	Tom2	6	2		2				1	2	2	2				
09/25/07	9092015	Tom2	6	2										1			
08/04/06	9092015	Tom2	6	3	2	2	1	51	27								
08/07/07	9092015	Tom2	6	3		2				1	2	2	2				
09/25/07	9092015	Tom2	6	3										1			
08/04/06	9092015	Tom2	12	1	3	2	1	45	23								
08/07/07	9092015	Tom2	12	1		2				1	2	2	2				
09/25/07	9092015	Tom2	12	1										1			
08/04/06	9092015	Tom2	12	2	3	2	1	48	30								
08/07/07	9092015	Tom2	12	2		2				1	2	2	2				
09/25/07	9092015	Tom2	12	2										1			
08/04/06	9092015	Tom2	12	3	3	2	1	48	35								
08/07/07	9092015	Tom2	12	3		2				1	2	2	2				
09/25/07	9092015	Tom2	12	3										1			
08/04/06	9092016	Tom3	5	1	3	1	1	66	36								
08/07/07	9092016	Tom3	5	1		1				2	2	2	1		x		
09/25/07	9092016	Tom3	5	1										1			
08/04/06	9092016	Tom3	5	2	2	2	2	57	26								
08/07/07	9092016	Tom3	5	2		1				2	2	2	1		x		
09/25/07	9092016	Tom3	5	2										1			
08/04/06	9092016	Tom3	5	3	2	2	2	57	31								
08/07/07	9092016	Tom3	5	3		1				2	2	2	1		x		
09/25/07	9092016	Tom3	5	3										1			slight blue-green

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/04/06	9092016	TOM3	7	1	2	1	1	63	25								good
08/07/07	9092016	TOM3	7	1		1				2	2	1	2		x early		
09/25/07	9092016	TOM3	7	1										1			
08/04/06	9092016	TOM3	7	2	2	1	1	51	33								good
08/07/07	9092016	TOM3	7	2		1				2	2	1	2		x early		
09/25/07	9092016	TOM3	7	2										1			
08/04/06	9092016	TOM3	7	3	2	1	1	54	35								good
08/07/07	9092016	TOM3	7	3		1				2	2	1	2		x early		
09/25/07	9092016	TOM3	7	3										1			
08/04/06	9092016	TOM3	12	1	2	1	2	57	23								
08/07/07	9092016	TOM3	12	1		2				2	2	2	2				
09/25/07	9092016	TOM3	12	1										1			few leaves
08/04/06	9092016	TOM3	12	2	2	1	2	54	27								
08/07/07	9092016	TOM3	12	2		2				2	2	2	2				
09/25/07	9092016	TOM3	12	2										1			few leaves
08/04/06	9092016	TOM3	12	3	2	1	2	63	24								
08/07/07	9092016	TOM3	12	3		2				2	2	2	2				
09/25/07	9092016	TOM3	12	3										1			few leaves
08/04/06	9092017	KN10	4	1	1	2	1	48	33								
08/07/07	9092017	KN10	4	1		2				1	2	2	1			x	dk seed heads, blue leaves
09/25/07	9092017	KN10	4	1										1			fine leaf, short
08/04/06	9092017	KN10	4	2	1	2	1	48	26								
08/07/07	9092017	KN10	4	2		2				1	2	2	1			x	dk seed heads, blue leaves
09/25/07	9092017	KN10	4	2										1			fine leaf, short
08/04/06	9092017	KN10	4	3	1	2	1	48	30								
08/07/07	9092017	KN10	4	3		2				1	2	2	1			x	dk seed heads, blue leaves
09/25/07	9092017	KN10	4	3										1			fine leaf, short
08/04/06	9092017	KN10	9	1	2	2	2	45	25								
08/07/07	9092017	KN10	9	1		2				1	2	2	2				mature black seed
09/25/07	9092017	KN10	9	1										1			blue-green, fine leaf
08/04/06	9092017	KN10	9	2	2	2	2	48	28								
08/07/07	9092017	KN10	9	2		2				1	2	2	2				black seed
09/25/07	9092017	KN10	9	2										1			blue-green, fine leaf
08/04/06	9092017	KN10	9	3	2	2	2	45	27								

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/07/07	9092017	KN10	9	3		2				1	2	2	2				black seed
09/25/07	9092017	KN10	9	3										1			blue-green, fine leaf
08/04/06	9092017	KN10	13	1	3	2	2	42	30								
08/07/07	9092017	KN10	13	1		2				1	2	2	1				black seed, blue leaves
09/25/07	9092017	KN10	13	1										1			fine leaf, basal
08/04/06	9092017	KN10	13	2	3	2	2	42	29								
08/07/07	9092017	KN10	13	2		2				1	2	2	1				black seed, blue leaves
09/25/07	9092017	KN10	13	2										1			fine leaf, basal
08/04/06	9092017	KN10	13	3	3	2	2	45	30								
08/07/07	9092017	KN10	13	3		2				1	2	2	1				black seed, blue leaves
09/25/07	9092017	KN10	13	3										1			fine leaf, basal
08/04/06	9092018	KN15	5	1	2	3	2	48	32								
08/07/07	9092018	KN15	5	1		2				1	2	2	2				
09/25/07	9092018	KN15	5	1										1			
08/04/06	9092018	KN15	5	2	2	3	3	45	23								
08/07/07	9092018	KN15	5	2		2				1	2	3	2				
09/25/07	9092018	KN15	5	2										1			
08/04/06	9092018	KN15	5	3	2	2	2	51	24								
08/07/07	9092018	KN15	5	3		2				1	2	2	2				
09/25/07	9092018	KN15	5	3										1			
08/04/06	9092018	KN15	10	1	2	2	2	48	24								
08/07/07	9092018	KN15	10	1		2				1	1	2	2				
09/25/07	9092018	KN15	10	1										1			
08/04/06	9092018	KN15	10	2	2	2	2	51	28								
08/07/07	9092018	KN15	10	2		2				1	1	2	2				
09/25/07	9092018	KN15	10	2										1			short, leaves basal
08/04/06	9092018	KN15	10	3	2	2	2	48	27								
08/07/07	9092018	KN15	10	3		2				1	1	3	2				
09/25/07	9092018	KN15	10	3										1			
08/04/06	9092018	KN15	11	1	2	3	2	48	21								
08/07/07	9092018	KN15	11	1		2				1	2	2	2				
09/25/07	9092018	KN15	11	1										1			leaves basal
08/04/06	9092018	KN15	11	2	2	3	2	48	23								
08/07/07	9092018	KN15	11	2		2				1	2	2	2				

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
09/25/07	9092018	KN15	11	2										1			leaves basal
08/04/06	9092018	KN15	11	3	2	3	2	48	23								
08/07/07	9092018	KN15	11	3		2				1	2	2	2				
09/25/07	9092018	KN15	11	3										1			leaves basal
08/04/06	9092019	KN30	5	1	2	2	3	48	32								
08/07/07	9092019	KN30	5	1		2				1	2	3	2				
09/25/07	9092019	KN30	5	1										1			
08/04/06	9092019	KN30	5	2	2	2	2	42	29								red
08/07/07	9092019	KN30	5	2		2				1	2	3	2				
09/25/07	9092019	KN30	5	2										1			
08/04/06	9092019	KN30	5	3	dead												
08/07/07	9092019	KN30	5	3						m	v small						very small
09/25/07	9092019	KN30	5	3										3			wrong species
08/04/06	9092019	KN30	7	1	1	2	2	42	30								
08/07/07	9092019	KN30	7	1		2				1	2	2	2				
09/25/07	9092019	KN30	7	1										1			
08/04/06	9092019	KN30	7	2	1	2	2	42	29								
08/07/07	9092019	KN30	7	2		2				1	2	2	2				
09/25/07	9092019	KN30	7	2										1			
08/04/06	9092019	KN30	7	3	1	2	2	42	26								
08/07/07	9092019	KN30	7	3		2				1	2	2	2				
09/25/07	9092019	KN30	7	3										1			
08/04/06	9092019	KN30	13	1	2	3	2	39	25								red
08/07/07	9092019	KN30	13	1		2				2	2	3	2				
09/25/07	9092019	KN30	13	1										1			
08/04/06	9092019	KN30	13	2	2	1	2	42	31								
08/07/07	9092019	KN30	13	2		2				2	2	2	2				
09/25/07	9092019	KN30	13	2										1			
08/04/06	9092019	KN30	13	3	2	1	2	45	31								
08/07/07	9092019	KN30	13	3		2				1	2	2	2				
09/25/07	9092019	KN30	13	3										1			
08/04/06	Holt	Holt	5	1	3	1	2	45	22								boot
08/07/07	Holt	Holt	5	1		2				3	1	1	1				
09/25/07	Holt	Holt	5	1										1			blue-green

Date	Accn.	Map Name	Row	Plt. No.	Leaf Width rating	Leafi-ness rating	Seed Culms rating	Culm Ht. (in.)	Spread (in.)	Phen-ology rating	Lodg-ing rating	Size rating	Color rating	Mature Seed rating	Select Forage	Select Lscp	Comments
08/04/06	Holt	Holt	5	2	3	1	3	36	31								boot
08/07/07	Holt	Holt	5	2		1				3	1	1	1				
09/25/07	Holt	Holt	5	2										3			blue-green
08/04/06	Holt	Holt	5	3	3	1	3	42	35								boot
08/07/07	Holt	Holt	5	3		1				3	1	1	2				
09/25/07	Holt	Holt	5	3										3			yellow-green, leafy
08/04/06	Holt	Holt	8	1	3	1	2	33	37								boot
08/07/07	Holt	Holt	8	1		2				3	1	1	2				
09/25/07	Holt	Holt	8	1										3			
08/04/06	Holt	Holt	8	2	3	1	2	33	42								boot, blue
08/07/07	Holt	Holt	8	2		2				3	3	1	1				blue
09/25/07	Holt	Holt	8	2										3			blue-green
08/04/06	Holt	Holt	8	3	3	1	2	33	33								boot
08/07/07	Holt	Holt	8	3		2				3	1	1	2				
09/25/07	Holt	Holt	8	3										3			
08/04/06	Holt	Holt	11	1	3	1	2	42	27								boot
08/07/07	Holt	Holt	11	1		1				3	2	1	2				
09/25/07	Holt	Holt	11	1										3			
08/04/06	Holt	Holt	11	2	3	1	2	51	38								boot
08/07/07	Holt	Holt	11	2		1				3	2	1	1				blue
09/25/07	Holt	Holt	11	2										3			slight blue-green
08/04/06	Holt	Holt	11	3	3	1	2	45	40								boot
08/07/07	Holt	Holt	11	3		1				3	2	1	1				blue
09/25/07	Holt	Holt	11	3										3			slight blue-green

ACTIVE STUDIES: TECHNICAL REPORT 2007

Study: NDPMC-P-0604-RA

Study Title: Evaluation of Prairie Junegrass (*Koeleria macrantha*)

Introduction: Prairie junegrass is a cool-season native grass that grows in small tufts. It has been described as excellent forage for livestock, deer, and elk early in the spring. As the grass is small, its production is low. The quality declines at maturity. It is one of the earliest grasses to begin vegetative growth in the spring. It is easily overgrazed and decreases with increased grazing pressure. It is a component of many native plant communities. No adapted release of prairie junegrass is currently available for revegetation and native seedings in the Northern Great Plains.

Objective: The purpose of this study is to evaluate, identify and assemble a population of prairie junegrass from North Dakota, South Dakota and Minnesota origins into a public release for conservation seedings in the Northern Great Plains.

Cooperators: USDA, Natural Resources Conservation Service

Description: Prairie junegrass is a short to medium lived, cool-season, perennial bunchgrass that is 6-20 inches tall. The roots are fibrous. Leaves are mostly basal. The seed head is a condensed panicle that opens slightly during flowering. Growth in the spring is usually completed by mid-June.

Distribution: Junegrass is native to most of North America, except the far southeast. It is also native to Europe and Northern Asia. It is very common in mixed grass and shortgrass prairie, meadows, open forest, mountain foothills, and rangeland. It is best adapted to well-drained soils in 12-20 inch precipitation areas.

Methods and Materials

Collection/Assembly: Seed heads were collected in 2006 and 2007 by NRCS employees from South Dakota, Minnesota, and North Dakota. Seed heads were clipped at maturity and sent to the Plant Materials Center where they were accessioned and placed in the seed cooler for storage until they are planted. Table PJ-1 is a list of collections with information regarding their origin.

Results and Discussion

Collection of seed was difficult in 2006 due to severe drought and heat in many portions of North and South Dakota. Seed will be propagated in the greenhouse in 2008.

Table PJ-1. Prairie junegrass *Koeleria macrantha* collection information.

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	1/2mi. W. of Missouri River State Park Hdqrtrs	
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	Praire 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 I-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, T92N, R156W	Curt Trulson land
9092089	L. Huether	7/5/06	ND	Mountrail	sec 21, T92N, R159W	Denny Farhart
9092090	W. Duckwitz	6/29/06	ND	Morton	NE1/4 sec 1, T82N, R140W	north of buildings
9092091	R. Jones	7/25/06	ND	Morton	sec 16, T139N, R85W	right behind New Salem Sue
9092092	Forman, Gustafson	7/10/06	ND	Rolette	SE1/4 NW1/4 sec 1, T160N, R72W	
9092093	D. Teske	7/8/06	ND	Morton	SW SW1/4, sec 14, T138N, R81W	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, R65W	Bald Mountain near Redfield (2 samples)
9092096	D. Teske	7/18/06	SD	Corson	SE1/4 sec 9, T18N, R21E	Cottonwood Creek
9092097	Jensen, Bergsagel	8/10/06	SD	Deuel	NE1/4 sec 16, T116N, R49W	8 mi north of Clear Lake along GMA fence

Accession	Collector	Date	State	County	Location	Other
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 4H	7/10/06	SD	Harding	North Cave Hills	
9092108	R. Jasken	summer06	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 I-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	NE NE sec 16, T149N, R99W	Gene Traustrom
9092116	Jones, Tober	7/20/06	MN		Agassis Dunes TNC 3 mi S of Fertile	
9092117	L. Alveshere	7/19/06	ND	McKenzie	SWNE sec 25, T149N, R95W	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)

Accession	Collector	Date	State	County	Location	Other
9092135	L. Voigt	7/3/06	ND	Dunn	SWNE sec30-T147-R93,w. saltbox	Andrew Voigt Ranch
9092136		7/24/06	SD	Brown	SW sec 2-T125-R63	1330 ft.elev. Slope 2%
9092177	D. Tober	8/31/07	ND	Ransom	Sheyenne Nat'l Grasslands, north trail	147th Ave.(Co. 53) 2 mi N of Hw 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, TNC	
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 Bearlodge MT
9092183	D. Tober	9/26/07	WY	Cook	Bearlodge MT. 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	Bearlodge MT. BHNF Warren Peak Lookout Tower 6656'	
9092186	D. Tober	9/26/07	WY	Cook	4 mi NW Sundance, BHNF Bear Lodge Mts.	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 1mi S. of Lincoln Rd.	1.5 mi E
9092198	W. Duckwitz	9/6/07	ND	Stark	NE1/4NE1/4 sec 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.

Accession	Collector	Date	State	County	Location	Other
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	.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	

ACTIVE STUDIES: TECHNICAL REPORT 2007

Study NDPMC-P-0601-RA

Study Title: Native Forbs/Legumes for Conservation
Fourwing saltbush *Atriplex canescens*

Introduction: Fourwing saltbush is a perennial shrub that offers potential for conservation plantings. It grows under low rainfall, can tolerate alkaline and saline conditions, and is palatable and nutritious to most livestock. Research at the Northern Great Plains Agricultural Research Service is evaluating its winter grazing potential.

Objective: The purpose of our study is to evaluate adaptability and produce seed of this species. A South Dakota collection of this species will be evaluated. If the species proves adaptable and useful as a conservation plant, a public release will be the goal.

Cooperators: USDA, NRCS Plant Materials Center, Bismarck, ND
USDA, ARS Northern Great Plains Research Service, Mandan, ND

Description: Fourwing saltbush is a long-lived perennial shrub. It has a deep, extensive root system. It is an evergreen gray shrub that grows from 2-6 feet tall. It has many branches. Leaves are alternate, and narrowly oblong. Leaves are scurfy on both sides. Male and female flowers are on separate plants. Flowers are in spikes that form dense panicles. It blooms in late summer. Fruiting bracts have four flat wings from which the plant gets its name. It is palatable to browse and grazing animals. Other common names include fourwing shadscale, white greasewood, salt sage, box brush. Fourwing saltbush differs from Nuttall saltbush. Its most noticeable difference is its four wings on the fruit, as opposed to the warty bracts enclosing the fruit of Nuttall saltbush.

Distribution: Fourwing grows on a wide range of soils, from clays to sands, and can tolerate high lime and saline conditions. It is highly drought and heat tolerant. It is native from western North Dakota south to Texas and Mexico, and west to Washington.

Methods and Materials

Assembly: Seed was collected from several plants at the SDSU Cottonwood Range and Livestock Research Center in Jackson County, South Dakota, by Ron Haigh in 1999. The collection site is in Major Land Resource Area 060A Pierre Shale Plains and Badlands. Its legal description is SW1/4 16-15-19E. Its latitude is 43°56'57" N and the longitude is 101°51'30" W. The seed was collected in an exclosure area that excluded cattle and wildlife. No other plants of the species are growing in the nearby vicinity except adjacent to the exclosure. These plants are grazed each year, and appear to have abundant regrowth each spring, according to Ron Haigh. A small envelope of seed was given to the PMC in 2000 by Scot Kronberg, USDA, ARS, Mandan. Seed was propagated in the greenhouse in cone-tainers beginning in January 2001 using soil less potting mix. Seeds germinated with no pretreatment. Seedlings were vigorous and growth was abundant. These plants were then planted at the Bismarck Plant Materials Center in Panel D10 within the deer fence. The original collection and the seed collected from the PMC planting will be identified as accession 9082680.

Planting Plan: Panel D10, Deer Fence, Bismarck Plant Materials Center. Conditions at the time of planting were dry. The plants were spaced approximately two feet apart. Approximately 25-27 seedlings were planted into a single row running east to west in 2001. In 2003, four additional rows of 9082680 seedlings were planted. The field was relatively free of weeds at the time of planting. The planting is adjacent to a row of winterfat.

Planting Date: 5/14/2001: Plants were transplanted to the field from the lath house where they were hardened off for a few weeks after moving from the greenhouse. In 2003, the planting was June 5.

Maintenance:
Weed Control:
2001-2007: Hand weeded around plants. Thistles were spot sprayed and borders were sprayed with glyphosate and between rows in 2004. Tillage was minimal. Weeds between rows were mowed 1-2 times each season. Primary weeds were kochia, pigweed, and lambsquarters, and foxtail.

Residue Management (D10):
2001-2003: No plant residue was clipped after harvest.
2004: Plants were clipped to a 4-8 inch height in November after seed harvest.
2005: No plant residue clipped.
2006: Plants were clipped to a 4-8 inch height in late fall after harvest.
2007: Plants were not clipped off in 2007.

Seed Processing: Seed harvested from Panel D10 in 2002 was cleaned using pan screens, a hammer mill with the largest hole screen and a clipper office fanning mill with a blank screen on the bottom, 25/64 to 28/64 size screens on top.

Seed harvested in 2003 was cleaned using an office-size debearder equipped with rubber corrugation covering the inside, and pan screens.

In 2004 through 2007, seed was cleaned using a debearder and fanning mill.

Evaluation (D10):
2001: Visual observations of growth were noted.

2002: Plant height and general growth characteristics of the plants were recorded. Seed was harvested by hand stripping on 10/24/2002. Seed was cleaned using a laboratory debearder and clipper fanning mill.

Samples of plant material were collected for forage quality testing. Analyses were by South Dakota State University. Twelve to fifteen inches of the tips of randomly selected plants were cut. Tips came from top and side branches. From these, 6 inch tips were cut and bulked as a sample. The sample included stem and leaf material. These samples were named Tips6. The remainder of the 12 inch to 15 inch cut pieces was used to make a leaf sample. The leaves were stripped from the branches and bulked together. This sample was designated LF12. Samples were air dried prior to sending for analyses of ADF, NDF, and Crude Protein.

2003: Seed was harvested by hand stripping from the 50-foot row planted in 2001 (deer fence D-10). Seed harvest was in late October.

2004-2007: Seed was hand harvested from all rows in D10.

Source Comparison Study: A small trial to compare performance of different sources of fourwing saltbush was planted 6/12/2003. Five plants each of three accessions were planted on the north end of panel A in the previous Initial Evaluation Planting area. Seedlings were grown in the greenhouse and planted to the field on 6/12/2003. Row spacing was 6-7 feet apart. Spacing between plants in the row was approximately 4 feet. Accessions compared were the South Dakota source (9082680), a Wyoming origin source from Wind River Seed (9082855, Wind River lot 14581), and Wytana, a Montana PMC release. The South Dakota source and Wind River seed are *Atriplex canescens*. Wytana is *Atriplex*

aptera which is a cross of *Atriplex canescens X nutallii*. The south most row is the Wyoming source, the center row is the South Dakota source, and the north most row is Wytana.

2004-2006: Plant residue was clipped in 2005. It was not clipped in 2006. Plant size was noted in 2004. See Table FW-3.

2007: Plant residue was not clipped.

Results and Discussion

South Dakota source 9082680 (Deer fence D-10)

2001

Seed readily germinated in the greenhouse. Seedling vigor was excellent. In the greenhouse, plants preferred getting dry before additional watering.

Plants were vigorous in the field and were two to three feet tall when measured on 9/30/2001. Conditions were dry during the growing season of 2001. No seed was produced its first year of growth.

2002

Plants were vigorous. Height on 8/13/2002 averaged 40 inches for the leafy plants which are males. The females which make up about 1/3 of the plants were extremely heavy with seed pods. Their average height was 30 inches. Seed was harvested on 10/24/2002. The plants had received a hard frost prior to harvest. The seed covering had a green tint at harvest. Seed yield was 5.5 pounds bulk clean seed.

Forage quality analyses can be found in Table FW-1. Although the study was not replicated and results were based on single samples, preliminary results indicate plants have some nutritional value.

Table FW-1. Forage analysis data of fourwing saltbush *Atriplex*

Sample	Analysis (percent)	As received basis	100% dry matter basis
LF2			
LF2	Total Moisture	16.5	0.000
LF2	Total Dry matter	83.5	100
LF2	Crude Protein	18.6	22.3
LF2	Acid Detergent Fiber	12.7	15.2
LF2	Neutral Detergent Fiber	22.5	27.0
TIP6	Total Moisture	24.1	0.000
TIP6	Total Dry matter	75.9	100
TIP6	Crude Protein	13.7	18.1
TIP6	Acid Detergent Fiber	20.0	26.3
TIP6	Neutral Detergent Fiber	30.1	39.7

2003

Plants again were quite vigorous. Conditions were very dry in 2003. Clean bulk seed harvested from the mature plants was 3.5 pounds. Seedlings planted in 2003 did not produce seed, but were vigorous.

2004-2006

Plants continued to grow larger in size. Seed production in 2005 was very poor. Plant residue had been cut in the fall of 2004. The plants were large and woody at that time. Plants were regrowing, but not vigorous enough to set seed. In 2006, seed production was excellent. It appears that clipping the residue every year or every other year allows for seed production. Clipping when plants are older requires a

year of regrowth before seed production resumes. This is probably influenced by moisture conditions as well as age of plants. Plants producing abundant seed in 2006 were flagged.

2007

Seed production was poor overall in 2007. There were no individual plants with a great abundance of seed. Plants flagged in 2006 did not all have seed in 2007. Seed ripening was very slow in 2007 and seed was not harvested until very late fall.

Seed Production

Year	Amount Harvested (bulk lbs)
2002	5.5
2003	3.5
2004	6.0
2005	0.5
2006	20.0
2007	5.0

Approximately 3 pounds bulk seed (1.8 PLS) was distributed to Lincoln-Oakes Nursery in 2007 for production of seedlings. Seed was not planted in 2007, but will be in 2008. Remaining seed at the PMC for all harvests will be mixed in anticipation of a trial planting.

Source Comparison Study

2003

Data collected on 9/24/03 indicated differences in growth form among the three accessions (see Table FW-2). Overall, plants of Wyoming origin (9082855 Wind River) were more upright and had less lateral spread than the South Dakota source (9082680). 9082680 had very lateral growth and branching. Wytana was not vigorous and showed little growth in 2003.

2004-2007

Size and shape varied among accessions. Wytana, an *Atriplex X* is much shorter and less vigorous than the South Dakota or Wind River source. The South Dakota source appeared to be slightly larger than the Wind River source. Seed was produced on all accessions in 2005 and 2006. Only a few plants within each accession appear to produce seed. Drought in 2006 did not appear to reduce the size of the plants. In 2007, seed production was poor. Differences in size and overall appearance of the plants were less noticeable between the Wyoming and South Dakota source in 2007.

Table FW-2. Fourwing saltbush *Atriplex canescens* evaluation data, taken on 9/24/2003.

Accession	E to W plant no.	Height (inches)	North-South Spread (inches)
9082855(WR)	1	7	31
9082855(WR)	2	4	11
9082855(WR)	3	16	22
9082855(WR)	4	12	16
9082855(WR)	5	13	18
9082680(SD)	1	12	27
9082680(SD)	2	3	29
9082680(SD)	3	5	26
9082680(SD)	4	6	42
9082680(SD)	5	15	18
Wytana	1	3	20
Wytana	2	3	6
Wytana	3	2	4
Wytana	4	2	5
Wytana	5	7	3

Table FW-3. Fourwing saltbush *Atriplex canescens* evaluation data, taken on 9/8/2004.

Accession	E to W plant no.	Height (inches)	Width (inches)	Fruit
9082855(WR)	1	33	62	
9082855(WR)	2	19	30	
9082855(WR)	3	31	50	
9082855(WR)	4	26	47	
9082855(WR)	5	18	50	yes
9082680(SD)	1	38	49	
9082680(SD)	2	31	43	yes
9082680(SD)	3	28	51	
9082680(SD)	4	36	50	
9082680(SD)	5	36	48	yes
Wytana	1	23	46	yes
Wytana	2	dead	x	
Wytana	3	11	14	
Wytana	4	5	23	
Wytana	5	13	23	yes

ACTIVE STUDIES - TECHNICAL REPORT 2007

Study: NDPMC-T-0301-WL

Study Title: Perennial Food Plot Study

Introduction: Perennial food plots would benefit wildlife managers as an additional habitat planting that could serve both as a food source and cover.

Objective: The objective of this 5-year study is to evaluate establishment and plant performance of species in two perennial seed mixes, a native mix and an introduced mix. Establishment and growth characteristics will be documented for each mix. Recommended species and seeding rates for wildlife perennial food plots is a potential outcome of this study.

Cooperators: The USDA, Natural Resources Conservation Service, Plant Materials Center, Bismarck, North Dakota, in cooperation with the North Dakota State Game and Fish Department, Bismarck, North Dakota.

Location: The study is located northeast of Wilton, North Dakota, on the Russell Stuart Wildlife Management Area (WMA) and Old John's Lake Wildlife Management Area. Two sites were identified, one on each of the wildlife management areas.

Major Land Resource Area: The study is located in MLRA 53B.

Climate: The annual precipitation is 16.5 inches of which about three fourths falls during April through September. Precipitation varies considerably from year to year, ranging from a low of 5.97 inches in 1936 to a high of 30.92 inches in 1876. The average frost free period is 134 days (May 11 through September 22). Plant hardiness zone is 3, with a minimum mean temperature of –30 to –40 degrees F (see climatological information and 2007 weather summary, pages 6-8).

Methods and Materials

Site Preparation and Seeding:
Both sites were chemically treated on June 10, 2003, and July 15, 2003, with a tank mix of 1 quart/ac of glyphosate and 1 pint/ac Poast®. The plot borders were mowed on August 8, 2004. A third chemical application of 2 quarts of glyphosate, 11 ounces of Stinger®, 2 pints of 2,4-D amine and 3 gallons of ammonia sulfate were applied on August 13, 2004. The plots were burned by the North Dakota Game and Fish Department on October 11, 2004.

Plots were planted on November 4, 2004, using a no-till Truax grass drill. Each site (2.4 acres) was split in half to make two plots (1.2 acre) per site. The south half of each plot was seeded to an introduced mix and the north half was seeded to a native mix. See Tables 1 and 2 for a list of native species and seeding information. See Tables 3 and 4 for a list of introduced species and seeding information. Each of the two plots was also split in half from north to south to compare establishment with and without herbicide application.

General Observations:
2004: The dense sod of Kentucky bluegrass and other low growing vegetation did not burn well at the Russell Stuart WMA site leaving large areas of litter on the soil surface. Kentucky bluegrass sod retained a large mass of both above and below ground residue that impacted seed to soil contact when no-till seeding into the killed and burned residue. Burning removed most surface litter at the Old John's

Lake WMA. The site was predominantly smooth bromegrass and sideoats grama, which provided a much more desirable seedbed. Available soil moisture at the time of seeding was good at both sites.

2005: The Russell Stuart WMA and the Old John's Lake WMA plots were split in half from north to south to allow half of the native seeding and half of the introduced seeding to have herbicide applied in 2005. A 4-oz/acre rate of Plateau® herbicide was applied on May 5, 2005. No surfactant was used in the application.

No planted seedlings were actively growing on any of the eight treatments at the time of Plateau® herbicide application on May 5, 2005. Canada thistle, absinth wormwood, and other weedy species seedlings were observed in low numbers for all treatments at this time. The Old John's Lake WMA plot had fewer actively growing weeds and less surface residue after over-wintering as compared to the Russell Stuart WMA plot. The surface (1-2 inch depth) soil moisture conditions in the plots were very dry.

Plots were evaluated in July 2005. Species counts were randomly taken using a 2.4-ft^2 frame. See Tables 5 through 8 for data collected on the Russell Stuart WMA plots and Tables 17 through 20 for data collected on the Old John's Lake WMA plots in 2005.

On September 9, 2005, general stand observations were noted. The following comments were recorded. All treatments on the Russell Stuart WMA plots had higher planted species densities and much less weed competition than the Old John's Lake WMA plots. All plots planted with native species had the greatest seedling emergence and stand establishment (at Russell Stuart WMA and Old John's Lake WMA plots). Lack of surface residue, which exposed black mineral soil, may have contributed to the poorer stands at Old John's Lake WMA plots. The soil surface may have warmed too soon in the spring, causing seeds to germinate and seedlings to freeze. The Russell Stuart WMA site had more surface residue and was lower in elevation which probably resulted in cooler soil temperatures. This may have reduced the chances for emergence of the planted species and potential of frost damage to the planted species.

2006: Both sites received very limited amounts of rainfall during the 2006 growing season. Late spring frosts and limited moisture reduced overall plant growth and caused early dormancy and death in some species. Native species showing persistence in the stand were stiff sunflower, Maximilian sunflower, purple prairie clover, blue flax, shell-leaf penstemon, big bluestem, and switchgrass. Introduced species observed in the highest numbers included intermediate wheatgrass, Dahurian wildrye, and alfalfa. Large populations of absinth wormwood invaded both sites even with the use of no-till methods. Old John's had the highest concentrations of absinth wormwood. The Russell Stuart plots were less contaminated. The success of these small food plots has been greatly influenced by the surrounding vegetation. Smooth bromegrass, quackgrass, and Kentucky bluegrass will quickly invade the plots even when they have been chemically removed prior to planting. See Tables 9-12 and 21-24 for data collection from 2006.

2007: Increased moisture conditions in 2007 had a positive effect on all planted species present in the plots. The use of no-till seeding methods still promoted perennial weeds such as absinth wormwood, quackgrass, and Kentucky bluegrass. These perennial weeds continue to invade the plots. Large populations of absinth wormwood invaded both sites. The Old John's plots had the highest concentrations of absinth wormwood, and it was decided to apply herbicides to control the absinth wormwood at the expense of some of the seeded perennial forbs and shrubs. An application of 2 quarts of 2, 4-D was applied on the Old John's plots on June 12, 2007. Species counts were completed and recorded on June 12, 2007, prior to chemical application. The Russell Stuart plots are not as contaminated and no herbicide was applied to the plots. Due to the small size of the food plots, success has been greatly affected by the surrounding vegetation. Smooth bromegrass, quackgrass, and Kentucky bluegrass have quickly invaded the plots even after being chemically removed from the plots prior to planting. Plantings dominated by forbs appear to be less competitive than grass dominated plantings and can result in invasion of unwanted species fairly quickly. The slow to no spreading characteristics of a

forb-dominated planting leaves high percentages of bare ground and a favorable weed environment. Seeding rates of forb dominated plantings may need to be increased to provide a denser canopy cover and less bare ground. See Tables 13-16 and 25-28 for data collection information from 2007.

Seedbed preparation and site selection are critical in perennial food plot success. Seeding into clean, weed-free cropland stubble may be the best option as both annual and perennial weeds will have been controlled throughout the cropping history. Seeding into killed grass sod (except Kentucky bluegrass sod) provides a very nice seedbed but potential weed banks and regrowth of perennial weed species will likely pose establishment problems. When seeding into killed sod, multiple chemical burn down applications are recommended for a minimum of two growing seasons for successful perennial weed control and food plot establishment. Spring planting is recommended as most forbs and native species require a shallow seeding depth and are prone to fall germination if soil and moisture temperatures are favorable. If a fall dormant seeding is planned, the seeding should occur when soil temperatures are below 40 degrees F. The seeding should also be planted into high residue amounts to help reduce soil temperature fluctuations and extended periods of warm soil conditions that promote fall germination of seed. These plantings provide beneficial diversity to the landscape and should be part of most wildlife management plans.

Five-Year Study Summary

This report is the final cumulative report (2003-2007) for the cooperative Perennial Food Plot Study. The following are main observations and findings from the study:

- Perennial food plots containing forbs and legumes are more attractive to wildlife species and provide additional food and cover types compared to grasses alone.
- Planting site management and seedbed preparation is critical for success. Existing weeds and soil seed banks should be controlled prior to seeding.
- Diverse seed mixes comprised of high percentages of forbs pose increased management concerns by limiting weed control options after planting.
- Perennial food plots can be a valuable addition in improving wildlife habitat when used in conjunction with other available wildlife practices, such as annual food plots, wildlife tree and shrub plantings, upland nesting habitat, and others as part of a complete wildlife management plan.
- Perennial food plot mixes, both native and introduced, need to be customized to each planting site with considerations given to soil type, annual precipitation, and other climatic conditions.
- Maximilian sunflower, stiff sunflower, Lewis blue flax, shell-leaf penstemon, stiff goldenrod, sainfoin, cicer milkvetch, and alfalfa were the forb species found with the highest densities on the sites. These species appear to compete well with weeds and provide flower, seed, and forage for wildlife use.
- Buffaloberry, snowberry, and prairie rose generally did the best of the shrub species.
- The size of perennial food plots should be a minimum of 5 to 10 acres to provide the greatest wildlife benefits.

Table 1. List of native species, including trees and shrubs, planted 11/04/2004 on two 1.2-acre sites.

Species	Name	Type*	Seeds per lb	Russ Stuart Planted PLS lb/ac	Old John's Planted PLS lb/ac
Elymus canadensis	Canada wildrye	g	115000	0.37	0.37
Panicum virgatum	switchgrass	g	390000	0.11	0.11
Andropogon gerardii	big bluestem	g	176000	0.21	0.21
Dalea candida	white prairieclover	l	278000	0.28	0.24
Dalea purpurea	purple prairieclover	l	290000	0.27	0.27
Astragalus canadensis	Canada milkvetch	l	266000	0.29	0.29
Amorpha canescens	leadplant	l	200000	0.39	0.38
Chamaecrista nictitans	partridge pea	l	50000	1.57	1.57
Helianthus maximilianii	Maximilian sunflower	f	250000	0.17	0.17
Helianthus pauciflorus	stiff sunflower	f	85000	0.51	0.51
Silphium perfoliatum	cup plant	f	34000	1.28	1.28
Linum lewisii	wild blue flax	f	287000	0.15	0.15
Ratibida columnifera	longheaded coneflower	f	737000	0.12	0.06
Liatris punctata	dotted gayfeather	f	63000	0.32	0.32
Echinacea angustifolia	echinacea	f	120000	0.36	0.37
Gaillardia aristata	blanket flower	f	157000	0.27	0.27
Penstemon grandiflorus	penstemon	f	273000	0.16	0.16
Rudbeckia laciniata	golden glow-cutleaf	f	252222	0.06+.12**	0.06+.12**
Solidago rigida	stiff goldenrod	f	772000	0.06	0.06
Agastache foeniculum	giant hyssops	f	1538000	0.03	0.03
Desmodium canadense	showy tick trefoil	f	88000	0.26	0.26
Monarda fistulosa	wild bergamot	f	1463000	0.03	0.03
Liatris ligulistylis	meadow blazingstar	f	90000est	0.09	0.09
Rosa arkansana	rose	w	45000	0.25	0.25
Shepherdia argentea	buffaloberry	w	41000	0.40	0.40
Amorpha fruticosa	false indigo	w	52000	0.32	0.32
Amelanchier alnifolia	juneberry	w	82000	0.20	0.20
Symphoricarpos occidentalis	snowberry	w	74400	0.22	0.22
Ribes aureum	currant	w	240000	0.07	0.07
Prunus virginiana	chokecherry	w	4790	3.40**	3.40**
Cornus sericea	redosier dogwood	w	18500	0.78	0.78
Coreopsis tinctoria	plains coreopsis	a	1650000	0.08	0.08

*Type: g=grasses; l=legumes; f=forbs; w=woodies; a=annuals

**bulk seed amount, not PLS

Table 2. Seeding information for native species, including trees and shrubs.

Type	grasses	legumes	forbs	woodies	annuals	Total seeds/ft^2*
number	3	5	15	8	1	30
%of mix	10	30	50	10	10	
seeds/ft^2/specie	1.00	1.80	1.00	0.38	3.00	
seeds/acre**	43560	78408	43560	16335	130680	

*Annuals were not counted in the 30 seeds/ft^2 seeding rate.

**Actual amount of seed planted for a species may differ from target seeding rate due to seed availability, quality and variation in seeds/pound (depending on reference).

Table 3. List of introduced species and native trees/shrubs planted 11/04/2004 on two 1.2-acre sites.

Species	Name	Type	Seeds per lb	Russ Stuart Planted PLS lb/ac	Old John's Planted PLS lb/ac
Leymus racemosus	mammoth wildrye	g	55000	3.58	3.55
Thinopyrum intermedium	intermediate wheatgrass	g	88000	0.76	0.76
Elymus dahuricus	dahurian wildrye	g	86000	0.76	0.76
Thinopyrum ponticum	tall wheatgrass	g	79000	0.82	0.82
Medicago sativa	alfalfa	l	210000	1.10	1.10
Astragalus cicer	cicer milkvetch	l	134000	1.37	1.37
Trifolium pratense	red clover	l	275000	0.67	0.67
Onobrychis vicifolia	sainfoin	l	22000	8.30	8.30
Vicia villosa	hairy vetch	l	20000	9.55	9.55
Rosa arkansana	rose	w	45000	0.37	0.37
Sherpherdia argentea	buffaloberry	w	41000	0.40	0.40
Amorpha fruticosa	false indigo	w	52000	0.32	0.32
Amelanchier alnifolia	juneberry	w	82000	0.20	0.20
Symphoricarpos occidentalis	snowberry	w	74400	0.22	0.22
Ribes aureum	currant	w	240000	0.07	0.07
Cornus sericea	redosier dogwood	w	18500	1.06	1.06
Prunus virginiana	chokecherry	w	4790	3.4**	3.4**
Coreopsis tinctoria	plains coreopsis	a	1650000	0.08	0.08

*Type: g=grasses; l=legumes; f=forbs; w=woodies; a=annuals
**bulk seed amount, not PLS

Table 4. Seeding information for introduced species and native trees/shrubs.

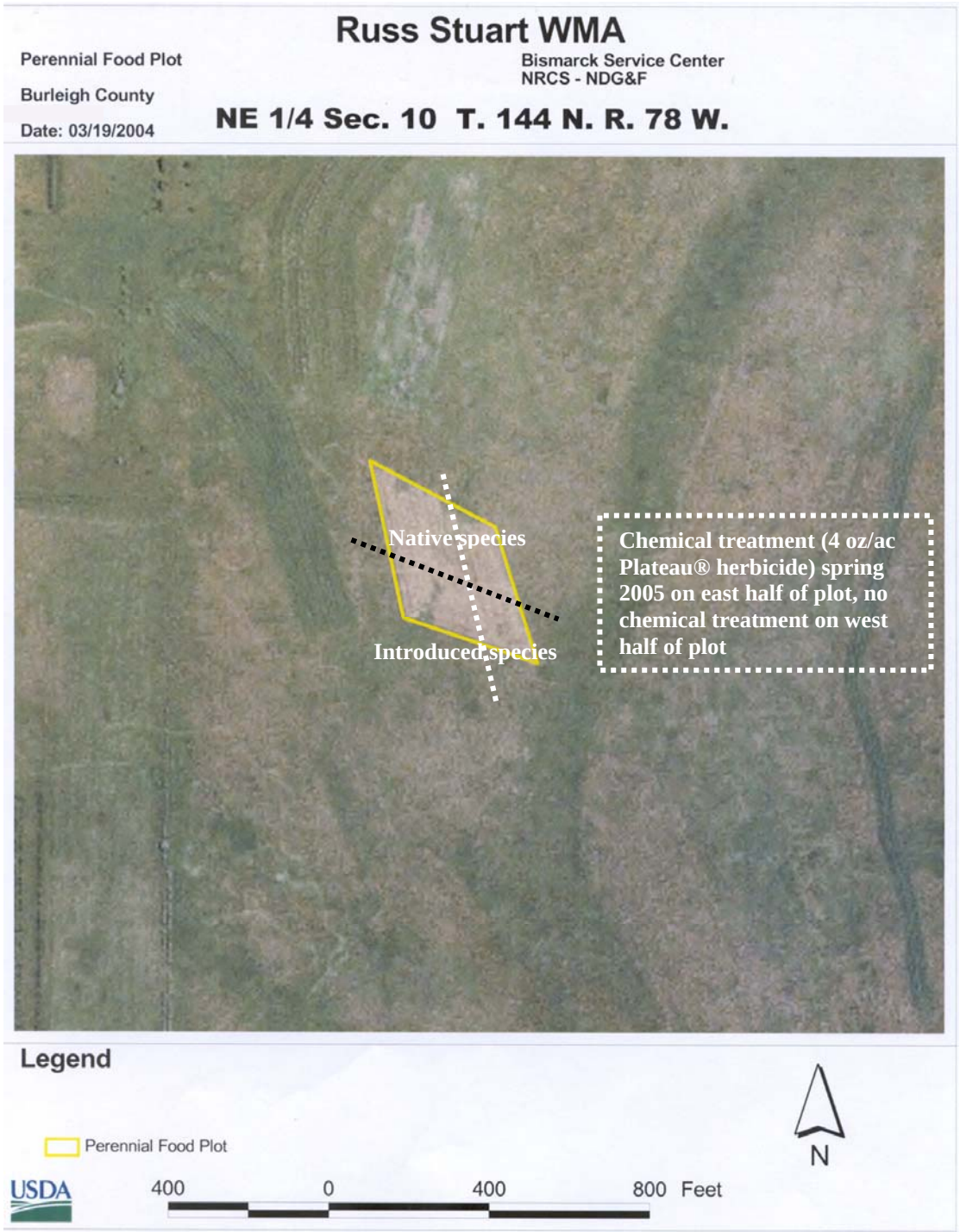
Type	grasses	legumes	forbs	woodies	annuals	Total seeds/ft^2*
number	4	5	0	8	1	30
%of mix	20	70	0	10	10	
seeds/ft^2/specie	1.50	4.20	0	0.38	3.00	
seeds/ac/specie**	65340	182952	0	16335	130680	

*Annuals were not counted in the 30 seeds/ft^2 seeding rate.
**Actual amount of seed planted for a species may differ from target seeding rate due to seed availability, quality and variation in seeds/pound (depending on reference).

Russell Stuart Wildlife Management Area

Site description:
The site is a 2.4-acre plot located on the Russell Stuart Wildlife Management Area in Burleigh County, North Dakota. The site is fairly level and is comprised primarily of Bearden silty clay loam; slight or very slight saline. The ecological site is "limy subirrigated." See Figure 1 for aerial view of the site.

Figure 1.



Russell Stuart Wildlife Management Area

Native species seeding - No Plateau® herbicide applied

2005: Weed competition from annual weeds was much higher compared to the native plot that had Plateau® herbicide applied. Annual weeds showing the highest populations were lambsquarter, common ragweed, and kochia. Most of the planted species were observed in the plot. Native shrubs including buffaloberry, golden currant, redosier dogwood, western snowberry, and juneberry were observed in this plot.

2006: Species showing the highest plant densities in the plots were shell-leaf penstemon, blue flax, stiff sunflower, and Maximilian sunflower. Similar to the native sprayed plot, there was a great diversity of species. Plots had less bare ground than the native sprayed plots but had increased amounts of invading Kentucky bluegrass.

2007: A 27 percent weed canopy was measured throughout this plot. Wild bergamot, cup plant, hyssops, Maximilian sunflower, shell-leaf penstemon, stiff goldenrod, stiff sunflower, yellow coneflower, and prairie rose were the dominant species present. The plot had good species diversity. The stand composition was similar to the native plot with Plateau® herbicide application but had more area of bare ground.

Native species seeding - Plateau® herbicide applied

2005: Large areas of bare ground were observed on this site. Canada thistle densities were higher compared to the unsprayed native plot. Most planted species were present but their growth was suppressed considerably. Maximilian sunflower and stiff sunflower appeared to be the least affected by the Plateau® herbicide in growth suppression. The overall stand composition was very similar to the unsprayed native plot.

2006: This plot has a more patchy appearance than the native unsprayed plot. Total cover is less due to reduced weed density. The increased bare ground has allowed increased encroachment of absinth wormwood and Canada thistle but less invasion of annual weeds and perennial grasses. This plot has good plant diversity with Maximilian sunflower, stiff sunflower, shell-leaf penstemon, blue flax, blanketflower, and hyssops being the most prominent in the plot.

2007: A 34 percent weed canopy was measured throughout this plot. Species composition was dominated by blanketflower, blue flax, narrow-leaved purple coneflower, Maximilian sunflower, stiff goldenrod, stiff sunflower, Canada wildrye, and western snowberry. Good species diversity existed throughout the plot.

Introduced species seeding - No Plateau® herbicide applied

2005: Annual weed population is similar to the native species seeding without the Plateau® herbicide application. Higher densities of annual weeds occur compared to the introduced species seeding that was sprayed with the Plateau® herbicide. Intermediate wheatgrass, tall wheatgrass, and Dahurian wildrye were the dominant planted grass species observed. The grasses observed were healthy and vigorous, many were headed out, and contained good seed fill. Alfalfa, sainfoin, and cicer milkvetch were the dominant planted forbs observed.

2006: These plots had the poorest stand of all Russell Stuart WMA plots. Planted species of intermediate wheatgrass, tall wheatgrass, Dahurian wildrye, and alfalfa dominated the site. Large populations of wormwood, Kentucky bluegrass, and smooth bromegrass invaded this plot.

2007: A 37 percent weed canopy was measured throughout this plot. Alfalfa, cicer milkvetch, sainfoin, intermediate wheatgrass, and Dahurian wildrye were the most dominant planted species of this plot. A good population of alfalfa and intermediate wheatgrass were found through out this plot.

Introduced species seeding - Plateau® herbicide applied

2005: A higher percentage of open ground was observed compared to the other three plots. Lower numbers of planted species were observed as compared to the unsprayed plot. Planted species present showed suppressed growth and lower vigor than the unsprayed introduced plot. Canada thistle populations were higher and annual weeds were lower on the sprayed plot compared to the unsprayed plot.

2006: The stand is much better than the unsprayed introduced plot. Plant diversity is higher compared to the unsprayed introduced plot. The planted species are more vigorous and have less competition from invading perennial weeds and more bare ground.

2007: A 51 percent weed canopy was measured throughout this plot. Alfalfa, sainfoin, intermediate wheatgrass, Dahurian wildrye, and western snowberry were the dominant planted species found in this plot. Large areas of Kentucky bluegrass were present in this plot. Higher weed populations developed on this plot compared to the other Russell Stuart plots.

Table 5. Russell Stuart WMA; native species seeded with herbicide application.
Random species counts taken 7/6/2005.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
bergamot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
blanketflower	1	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	**5**
blue flax	1	1	3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**6**
Canada milkvetch	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**2**
coreopsis	0	0	0	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	**5**
cupplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
dotted blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
echinacea-coneflower	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	**2**
golden glow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
hyssops	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
leadplant	0	0	0	0	3	0	1	0	0	0	0	0	0	0	1	0	0	1	1	0	**7**
longheaded coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Maximilian sunflower	0	1	0	0	1	0	0	1	0	3	0	0	0	0	0	0	0	0	0	1	**7**
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
partridge pea	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**
penstemon	3	1	4	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	**9**
purple prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
stiff goldenrod	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**2**
stiff sunflower	0	0	0	2	0	0	2	1	0	1	0	4	0	0	0	0	0	0	0	0	**10**
tick trefoil	2	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	**6**
white prairieclover	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
yellow coneflower	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
big bluestem	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	**3**
Canada wildrye	0	0	0	0	0	1	0	0	0	1	0	0	0	2	0	0	0	1	0	0	**5**
switchgrass	1	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	**4**
buffaloberry	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	**2**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	**2**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
prairie rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red dogwood	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	5	3	3	15	45	2	5	5	1	1	1	0	2	10	1	2	0	0	0	0	**5**

Table 6. Russell Stuart WMA; native species seeded with no herbicide application.
Random species counts taken 7/6/2005.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
bergamot	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**2**
blanketflower	1	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	1	0	**5**
blue flax	0	0	2	0	1	0	0	0	0	0	1	0	0	1	0	2	0	1	0	0	**8**
Canada milkvetch	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	**6**
coreopsis	1	1	2	1	2	11	0	0	0	0	0	4	4	0	0	0	1	0	2	0	**29**
cupplant	2	0	1	0	0	0	0	2	1	0	0	0	0	0	0	2	0	0	0	0	**8**
dotted blazing star	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	**3**
echinacea-coneflower	0	0	0	1	0	0	1	0	3	2	0	0	0	0	0	0	0	0	0	1	**8**
golden glow	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
hyssops	0	0	0	0	0	1	0	0	0	0	1	0	1	0	1	0	0	0	0	0	**4**
leadplant	0	0	0	2	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	**5**
longheaded coneflower	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
Maximilian sunflower	1	0	2	1	0	1	0	0	0	0	2	1	2	2	0	0	0	1	0	0	**13**
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	**1**
partridge pea	0	0	0	0	2	0	0	3	0	0	1	0	1	0	0	1	0	0	0	0	**8**
penstemon	0	3	0	0	1	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	**7**
purple prairieclover	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	**4**
stiff goldenrod	0	0	1	2	1	2	1	0	0	0	0	1	1	0	2	0	0	0	0	0	**11**
stiff sunflower	0	1	1	0	2	3	0	0	0	0	0	1	0	0	1	0	1	1	1	0	**12**
tick trefoil	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	**4**
white prairieclover	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
yellow coneflower	0	0	0	0	0	0	0	0	0	0	0	2	1	0	1	0	0	0	2	0	**6**
big bluestem	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
Canada wildrye	0	2	1	0	1	0	0	0	1	1	0	1	1	0	0	1	0	1	0	0	**10**
switchgrass	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	**1**
buffaloberry	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	**4**
juneberry	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
prairie rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red dogwood	0	0	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0	0	0	0	**4**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	50	2	40	30	70	25	1	15	15	40	5	10	10	10	15	20	45	55	50	5	**26**

Table 7. Russell Stuart WMA, introduced species seeded with herbicide application.
Random species counts taken 7/6/2005.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
alfalfa	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	**3**
cicer milkvetch	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
sainfoin	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**1**
planted grasses	10	1	3	4	2	1	5	0	0	6	3	0	5	5	2	0	7	2	3	3	**62**
buffaloberry	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	**4**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
redosier dogwood	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	**2**
																					Avg
WEED CANOPY %	2	1	5	10	2	0	10	2	5	3	3	15	3	2	3	1	2	0	10	20	**5**

Table 8. Russell Stuart WMA; introduced species seeded with no herbicide application. Random species counts taken 7/6/2005.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
alfalfa	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	**3**
cicer milkvetch	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	**3**
hairy vetch	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	**2**
plains coreopsis	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	**3**
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
sainfoin	0	0	0	1	0	0	0	1	0	1	0	0	1	0	0	1	0	0	2	1	**8**
planted grasses	0	0	3	9	7	2	1	5	0	4	3	2	0	2	8	3	5	3	2	10	**69**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**1**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	**3**
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
redosier dogwood	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	60	30	80	30	0	5	15	35	30	60	10	5	35	50	35	75	60	95	50	75	**42**

Table 9. Russell Stuart WMA; native species seeded with herbicide application.
Random species counts taken 9/8/2006.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
bergamot	6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	**9**
blanketflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
blue flax	0	0	0	0	2	0	0	2	2	2	0	0	0	0	1	0	0	1	1	1	**12**
Canada milkvetch	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	**2**
coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
cupplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**1**
dotted blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
echinacea-coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	**2**
golden glow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	**2**
hyssops	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
leadplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
longheaded coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Maximilian sunflower	0	7	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	**10**
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
partridge pea	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	**3**
penstemon	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**2**
purple prairieclover	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**2**
stiff goldenrod	0	1	0	0	1	0	0	1	0	1	0	0	0	0	1	0	0	0	0	2	**7**
stiff sunflower	6	2	6	6	0	9	0	5	0	0	0	0	0	0	13	0	0	10	5	0	**62**
tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	**2**
white prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
yellow coneflower	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	0	0	**7**
big bluestem	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Canada wildrye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
switchgrass	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	1	1	0	**6**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
prairie rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	0	0	0	0	0	3	2	0	0	0	2	0	1	0	0	0	0	0	0	2	**10**
																					Avg
WEED CANOPY %	15	20	10	5	20	5	10	25	40	10	5	10	5	25	15	20	5	10	10	10	**14**

Table 10. Russell Stuart WMA; native species seeded with no herbicide application.
Random species counts taken 9/8/2006.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
bergamot	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
blanketflower	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
blue flax	1	0	3	0	1	0	0	5	0	0	0	0	3	0	0	0	0	1	0	0	**14**
Canada milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
cupplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
dotted blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
echinacea-coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**1**
golden glow	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	**2**
hyssops	3	0	0	0	0	0	0	0	0	0	0	2	0	3	0	0	0	0	0	0	**8**
leadplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
longheaded coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Maximilian sunflower	3	3	0	5	8	0	5	5	3	0	2	0	7	0	12	5	0	14	0	0	**72**
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
partridge pea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
penstemon	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	1	0	0	0	**4**
purple prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
stiff goldenrod	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	**7**
stiff sunflower	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	4	2	**10**
tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
white prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
yellow coneflower	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	1	0	2	**6**
big bluestem	0	0	0	0	0	1	0	0	1	0	0	0	0	2	0	0	0	0	0	0	**4**
Canada wildrye	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	3	0	0	0	2	**8**
switchgrass	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	**3**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
prairie rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	**2**
																					Avg
WEED CANOPY %	60	40	30	10	30	50	40	70	20	30	50	40	80	40	20	30	30	30	50	20	**39**

Table 11. Russell Stuart WMA, introduced species seeded with herbicide application. Random species counts taken 9/8/2006**.**

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
alfalfa	0	0	1	0	4	0	0	0	0	0	2	1	0	1	0	0	0	0	0	1	**10**
cicer milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
sainfoin	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	**2**
Dahurian wildrye	1	0	1	0	0	1	0	0	0	0	0	1	2	0	1	1	1	1	2	1	**13**
intermediate wheatgrass	0	0	0	1	2	1	1	0	0	1	2	0	0	2	0	0	0	3	0	0	**13**
mammoth wildrye	0	0	0	0	0	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	**5**
tall wheatgrass	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	**3**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	1	1	0	0	**5**
																					Avg
WEED CANOPY %	10	5	5	10	5	5	5	5	10	30	40	25	50	10	5	20	20	30	10	10	**16**

Table 12. Russell Stuart WMA, introduced species seeded without herbicide application.
Random species counts taken 9/8/2006.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
alfalfa	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	0	1	0	**5**
cicer milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**1**
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
sainfoin	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	**2**
Dahurian wildrye	1	1	0	3	1	1	0	2	1	0	1	1	1	1	2	0	0	3	2	1	**22**
intermediate wheatgrass	0	2	1	0	0	1	1	1	0	1	0	1	1	0	0	1	1	0	0	0	**11**
mammoth wildrye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
tall wheatgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
																					Avg
WEED CANOPY %	50	40	60	60	50	40	30	20	60	50	30	20	75	60	80	40	30	50	40	40	**46**

Table 13. Russell Stuart WMA; native species with herbicide application.
Random species counts taken July 12, 2007.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
bergamot	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	**1**
blanketflower	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	1	0	0	**4**
blue flax	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	**6**
Canada milkvetch	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
cupplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**1**
dotted blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
echinacea-coneflower	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	**5**
golden glow	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**
hyssops	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
leadplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
longheaded coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	**2**
Maximilian sunflower	0	0	2	0	0	2	0	0	0	0	5	0	0	0	13	0	0	0	0	5	**27**
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
partridge pea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
penstemon	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	**2**
purple prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	**2**
stiff goldenrod	0	0	0	0	0	0	0	2	0	16	0	0	0	0	0	0	0	0	0	0	**18**
stiff sunflower	0	7	9	0	0	3	1	0	0	0	1	4	8	7	9	1	4	3	4	8	**69**
tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
white prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
yellow coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	**2**
big bluestem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Canada wildrye	2	0	0	1	0	0	0	1	0	0	0	1	0	0	1	1	0	0	0	1	**8**
switchgrass	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	**1**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	**1**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
prairie rose	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	**2**
red dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	4	0	2	0	1	0	0	4	0	0	0	0	0	2	2	1	0	0	0	0	**16**
																					Avg
WEED CANOPY %	20	40	30	20	60	80	80	30	40	10	10	10	10	10	50	30	80	20	30	10	**34**

Table 14. Russell Stuart WMA; native species with no herbicide application.
Random species counts taken July 12, 2007.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
bergamot	0	1	0	0	0	3	0	3	0	0	1	0	0	0	0	0	0	4	0	0	**12**
blanketflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
blue flax	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Canada milkvetch	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
cupplant	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	**5**
dotted blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
echinacea-coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
golden glow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
hyssops	0	6	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	**10**
leadplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
longheaded coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Maximilian sunflower	4	0	0	17	16	3	15	1	11	0	2	0	5	0	4	7	6	8	0	0	**99**
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
partridge pea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
penstemon	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	**5**
purple prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
stiff goldenrod	1	0	0	0	7	0	1	1	0	0	0	2	0	1	0	0	0	0	0	1	**14**
stiff sunflower	1	15	0	0	0	5	2	1	4	8	1	3	0	5	4	0	3	4	0	4	**60**
tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
white prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
yellow coneflower	0	0	1	0	0	0	0	0	4	2	0	1	2	0	0	0	0	0	0	0	**10**
big bluestem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Canada wildrye	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	**2**
switchgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
prairie rose	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
red dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	30	30	30	20	20	10	10	20	10	15	40	30	10	30	20	40	40	20	80	30	**27**

Table 15. Russell Stuart WMA; introduced species with herbicide application.
Random species counts taken July 12, 2007**.**

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
alfalfa	0	0	0	1	0	0	0	2	0	2	0	0	0	0	2	1	0	1	0	0	**9**
cicer milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
sainfoin	0	0	0	0	2	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	**4**
planted grasses	0	2	2	3	3	3	2	1	1	1	3	0	0	2	0	1	1	2	4	1	**32**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
redosier dogwood	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	**4**
rose	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	**2**
snowberry	0	4	0	1	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	**8**
																					Avg
WEED CANOPY %	100	80	70	20	10	20	40	20	70	70	30	80	70	20	70	70	70	50	40	20	**51**

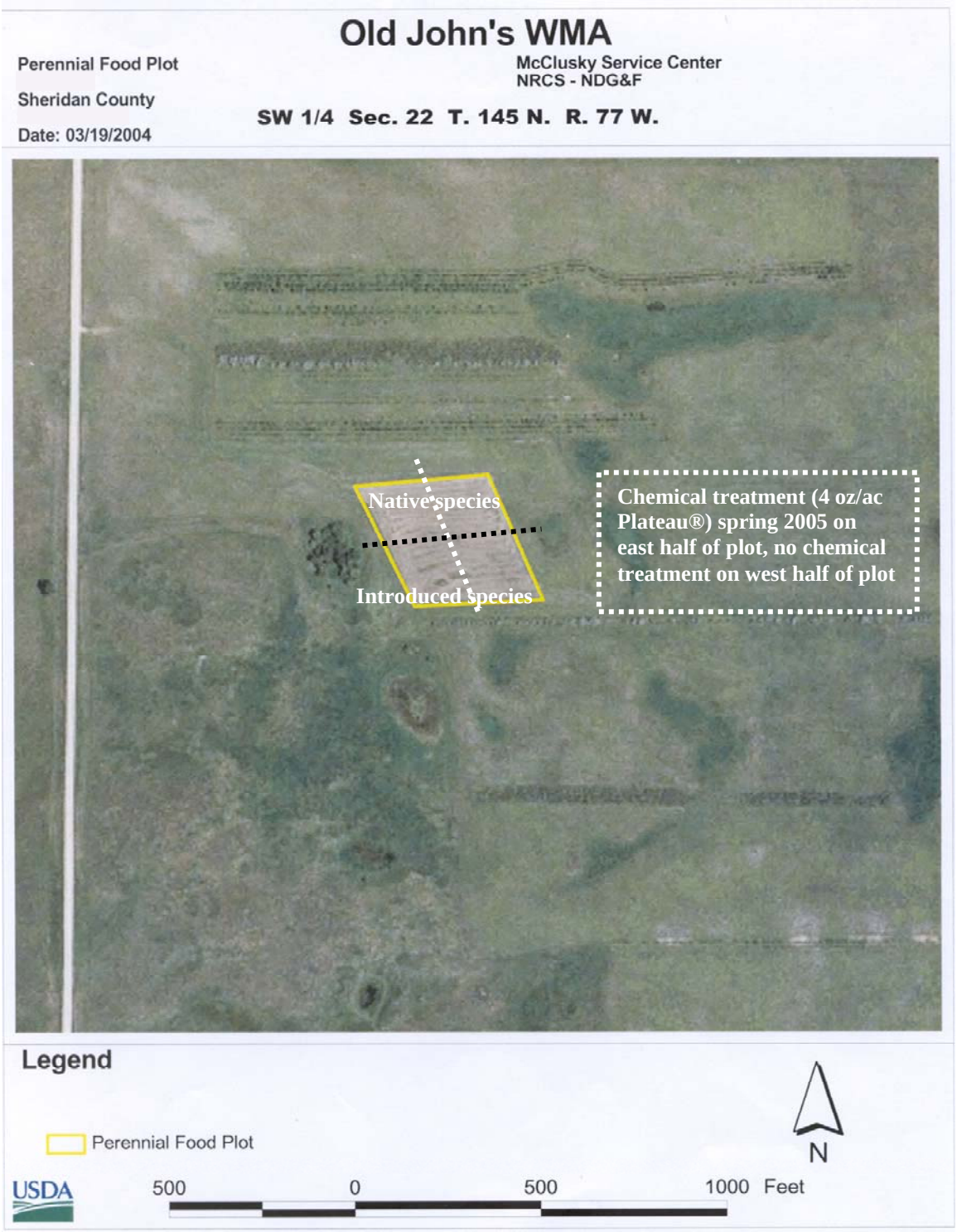
Table 16. Russell Stuart WMA; introduced species with no herbicide application.
Random species counts taken July 12, 2007.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
alfalfa	1	0	1	1	0	1	1	2	0	2	1	1	0	1	0	0	0	1	0	0	**13**
cicer milkvetch	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	2	2	0	0	1	**8**
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
sainfoin	0	0	0	5	0	2	1	1	0	1	0	0	0	0	0	0	0	0	0	0	**10**
planted grasses	2	6	2	1	0	3	5	3	0	1	2	1	1	0	1	0	2	1	2	3	**36**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
rose	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**
snowberry	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
																					Avg
WEED CANOPY %	30	30	10	10	50	60	20	20	80	10	40	10	80	80	70	70	10	50	0	10	**37**

Old John's Lake Wildlife Management Area

Site description:
The site is a 2.4-acre plot located on Old John's Lake Wildlife Management Area in Sheridan County, North Dakota. Soils are mapped as a Williams loam on B slope. The ecological site is loamy. See Figure 2 for an aerial view of the site.

Figure 2.



Old John's Lake WMA Plot

Native species seeding - No Plateau® herbicide applied

2005: High weed competition was observed with high densities of quackgrass, green foxtail, smooth bromegrass, and absinth wormwood present. This plot had the most planted species present in the planting. The population of both Maximilian and stiff sunflower was less compared to the sprayed native plot. Little bare ground was present at this time. The best stands were observed on the higher aspects of the site due to the decreased weed competition as compared to the lower site. Good densities of switchgrass and big bluestem were seen.

2006: Diversity of planted species was high. Shell-leaf penstemon, stiff sunflower, Maximilian sunflower, hyssops, green needlegrass, Canada wildrye, and big bluestem were the dominant planted species observed. Quackgrass and smooth bromegrass were very dense in many areas.

2007: A 43 percent weed canopy was measured throughout this plot. Blue flax, Maximilian sunflower, shell-leaf penstemon, stiff sunflower, and big bluestem were the dominant species observed.

Native species seeding - Plateau® herbicide applied

2005: More bare ground was observed compared to the unsprayed plot. Sweetclover and Canada thistle densities were higher on this site as compared to the unsprayed plot. Planted species densities were less and had suppressed growth when compared to the unsprayed.

2006: This plot had the highest density of quackgrass compared to all the Old John's plots. More bare ground was observed compared to the unsprayed plots. The species diversity was high. Species most prevalent were shell-leaf penstemon, blanketflower, stiff sunflower, Maximilian sunflower, and wild bergamot. Extremely dry conditions and the competition of quackgrass noticeably reduced the plant vigor of the native species.

2007: A 42 percent weed canopy was measured throughout the plot. Stiff sunflower, Maximilian sunflower, shell-leaf penstemon, hyssops, and prairie rose were the dominant species on this plot. Populations of new stiff sunflower seedlings were observed in high numbers on this plot. Quackgrass and absinth wormwood were abundant.

Introduced species seeding -No Plateau® herbicide applied

2005: The heaviest concentrations of absinth wormwood were observed on this site. The stand was poor and very few of the planted species were observed. Highest densities of sweetclover, smooth bromegrass, and annual weeds occurred compared to the other three treatments.

2006: The stand was very poor and the density of smooth bromegrass, yellow sweetclover, and absinth wormwood was high. Some alfalfa, intermediate wheatgrass, and Dahurian wildrye was present but vigor was greatly reduced.

2007: A 54 percent weed canopy was measured throughout this plot. Alfalfa, cicer milkvetch, and intermediate wheatgrass were most abundant on this plot. Very high populations of absinth wormwood and quackgrass were present on this plot. This plot contained the highest weed populations of all the Old John's plots.

Introduced species seeding - Plateau® herbicide applied

2005: The overall stand was poor. Some of the planted species were present in very low numbers. Their growth was suppressed. A higher percentage of bare ground was observed.

2006: There was an increased percentage of bare ground compared to the unsprayed plots. Cicer milkvetch and alfalfa were fairly abundant in this plot and plant vigor is good. The plot had the lowest concentrations of absinth wormwood but a heavy invasion of sweetclover. This plot lacks the grass component and was rated as poor.

2007: A 49 percent weed canopy was measured throughout this plot. Alfalfa, cicer milkvetch, prairie rose, and intermediate were the most prevalent species recorded in frames.

Table 17. Old John's Lake WMA; native species seeded with herbicide application. Random species counts taken 7/6/2005.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
bergamot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
blanketflower	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	**3**
blue flax	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	1	**4**
canada milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
coreopsis	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	**4**
cupplant	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**3**
dotted blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**1**
echinacea-coneflower	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	1	**5**
golden glow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
hyssops	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
leadplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
longheaded coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Maximilian sunflower	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
partridge pea	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**2**
penstemon	0	0	0	0	1	1	0	0	0	0	0	0	3	0	0	0	0	1	0	1	**7**
purple prairieclover	0	0	0	0	0	0	1	0	0	0	0	0	2	0	1	0	0	1	0	0	**5**
stiff goldenrod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
stiff sunflower	0	0	0	1	0	1	1	1	1	1	0	0	1	1	1	0	0	1	0	0	**10**
tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
white prairieclover	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	**3**
yellow coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
big bluestem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	**1**
Canada wildrye	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	**2**
switchgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
buffaloberry	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**1**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
prairie rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	5	3	2	20	1	10	10	15	65	20	1	25	15	75	15	2	2	3	20	35	**17**

Table 18. Old John's Lake WMA; native species seeded with no herbicide application.
Random species counts taken 7/6/2005.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
bergamot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
blanketflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**1**
blue flax	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	2	0	0	**5**
Canada milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
coreopsis	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	**2**
cupplant	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	**1**
dotted blazing star	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**1**
echinacea-coneflower	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	**4**
golden glow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
hyssops	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
leadplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
longheaded coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Maximilian sunflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	**2**
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
partridge pea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
penstemon	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	**3**
purple prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	**1**
stiff goldenrod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**1**
stiff sunflower	1	0	1	0	0	0	0	0	0	0	0	0	0	2	1	0	2	0	1	0	**8**
tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
white prairieclover	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	0	0	0	0	1	**5**
yellow coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
big bluestem	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	**4**
Canada wildrye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**
switchgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	**2**
buffaloberry	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
prairie rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	15	15	20	75	70	90	70	40	80	90	50	15	25	65	40	30	15	25	30	65	**46**

Table 19. Old John's Lake WMA; introduced species seeded with herbicide application.
Random species counts taken 7/6/2005.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
alfalfa	1	2	2	2	0	0	3	0	0	1	0	0	2	0	0	0	0	0	0	1	**14**
cicer milkvetch	1	2	1	1	0	0	0	0	0	0	1	0	2	0	0	0	0	0	1	1	**10**
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
sainfoin	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
planted grasses	1	0	2	0	0	0	0	0	1	0	0	0	0	0	0	4	6	0	0	0	**14**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	50	20	25	25	60	5	35	35	15	35	20	20	15	70	10	15	60	15	10	15	**28**

Table 20. Old John's Lake WMA; introduced species seeded with no herbicide application.
Random species counts taken 7/6/2005.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
alfalfa	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	**3**
cicer milkvetch	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	**3**
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
sainfoin	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
planted grasses	0	0	2	3	6	6	0	2	2	0	2	2	3	9	3	0	0	0	0	0	**40**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	**2**
rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	70	40	50	35	40	70	30	60	65	70	75	50	90	95	95	75	70	85	30	60	**63**

Table 21. Old John's Lake WMA; native species seeded with herbicide application.
Random species counts taken 9/8/2006.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
bergamot	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
blanketflower	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
blue flax	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
Canada milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
cupplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
dotted blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
echinacea-coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	**2**
golden glow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	**1**
hyssops	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
leadplant	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
longheaded coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Maximilian sunflower	2	0	3	1	0	2	0	1	3	1	3	0	0	0	0	1	0	3	0	0	**20**
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
partridge pea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
penstemon	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	**2**
purple prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	**2**
stiff goldenrod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
stiff sunflower	0	10	0	0	0	4	0	2	0	0	0	0	0	0	1	2	0	0	0	0	**19**
tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**1**
white prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
yellow coneflower	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
big bluestem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Canada wildrye	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	1	0	0	0	0	**5**
switchgrass	2	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
prairie rose	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	**5**
red dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	10	15	5	10	20	80	20	10	15	20	10	10	5	20	10	50	40	20	10	5	**19**

Table 22. Old John's Lake WMA; native species seeded with no herbicide application.
Random species counts taken 9/8/2006.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
bergamot	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
blanketflower	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	**1**
blue flax	0	0	0	0	0	0	5	0	0	0	0	1	1	0	0	0	0	0	0	0	**7**
Canada milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**1**
coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
cupplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
dotted blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
echinacea-coneflower	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
golden glow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
hyssops	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
leadplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
longheaded coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Maximilian sunflower	2	0	1	0	0	1	1	0	0	4	5	0	0	0	0	0	1	0	1	0	**16**
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
partridge pea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
penstemon	0	0	0	4	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	**6**
purple prairieclover	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	**2**
stiff goldenrod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
stiff sunflower	0	0	0	0	1	0	0	0	19	2	0	12	1	14	2	6	1	2	0	0	**60**
tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
white prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
yellow coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	**1**
big bluestem	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	**3**
Canada wildrye	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	**4**
switchgrass	0	0	0	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	**5**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
prairie rose	0	0	0	0	1	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	**7**
red dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	60	50	20	70	50	80	90	60	60	50	70	60	70	70	80	80	70	70	60	50	**64**

Table 23. Old John's Lake WMA; introduced species seeded with herbicide application.
Random species counts taken 9/8/2006.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
alfalfa	0	0	2	0	0	0	0	0	0	0	0	1	0	2	2	2	2	3	4	1	**19**
cicer milkvetch	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**1**
hairy vetch	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
sainfoin	0	1	0	2	0	0	0	0	1	0	0	1	0	0	2	0	1	0	0	3	**11**
Dahurian wildrye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
intermediate wheatgrass	0	0	0	0	1	0	2	1	0	2	1	1	0	0	0	1	0	1	1	0	**11**
mammoth wildrye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
tall wheatgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
rose	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	**4**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	40	20	60	30	20	20	30	50	40	30	20	60	20	40	40	50	20	30	30	20	**34**

Table 24. Old John's Lake WMA; introduced species seeded with no herbicide application. Random species counts taken 9/8/2006.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
alfalfa	0	0	0	0	0	3	1	0	0	1	1	0	0	0	0	1	0	0	0	0	**7**
cicer milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
sainfoin	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Dahurian wildrye	1	1	0	0	2	0	0	0	0	0	0	1	3	4	0	1	0	0	0	0	**13**
intermediate wheatgrass	0	1	0	1	0	1	0	0	0	1	1	1	0	0	1	1	1	1	0	0	**10**
mammoth wildrye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
tall wheatgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
rose	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	**1**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	60	50	80	90	70	60	60	70	60	80	70	50	40	50	60	70	50	70	80	80	**65**

Table 25. Old John's Lake WMA; native species seeded with herbicide application.
Random species counts taken 6/12/2007.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
bergamot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
blanketflower	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	**3**
blue flax	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	**3**
Canada milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
cupplant	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
dotted blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
echinacea-coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
golden glow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**1**
hyssops	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	**4**
leadplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
longheaded coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Maximilian sunflower	0	0	1	0	0	0	0	0	0	0	0	4	2	0	0	0	9	0	0	0	**16**
meadow blazing star	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	**3**
partridge pea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
penstemon	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	1	1	0	0	**5**
purple prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**1**
stiff goldenrod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
stiff sunflower	5	0	29	0	0	23	0	0	11	0	8	1	0	0	2	0	0	14	11	1	**105**
tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
white prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
yellow coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**1**
big bluestem	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	**2**
Canada wildrye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
switchgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	**1**
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
prairie rose	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	**4**
red dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	20	20	10	15	30	80	40	40	30	20	75	70	20	80	70	60	30	40	50	40	**42**

Table 26. Old John's Lake WMA; native species seeded with no herbicide application.
Random species counts taken 6/12/2007.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
bergamot	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	**3**
blanketflower	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**3**
blue flax	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0	1	1	0	0	**5**
Canada milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
cupplant	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	**2**
dotted blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
echinacea-coneflower	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**1**
golden glow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
hyssops	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
leadplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
longheaded coneflower	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Maximilian sunflower	0	0	0	2	0	0	6	3	0	6	0	0	0	0	0	1	0	1	0	0	**19**
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
partridge pea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
penstemon	0	0	0	0	4	1	0	1	0	0	0	0	0	1	1	0	0	0	0	0	**8**
purple prairieclover	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**1**
stiff goldenrod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
stiff sunflower	12	0	15	8	0	8	10	1	12	0	18	8	4	2	0	0	0	0	0	0	**98**
tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
white prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
yellow coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
big bluestem	0	0	0	1	1	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	**5**
Canada wildrye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
switchgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
prairie rose	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
red dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	40	70	20	20	20	15	10	30	18	10	30	35	75	60	70	40	80	70	80	60	**43**

Table 27. Old John's Lake WMA; introduced species seeded with herbicide application.
Random species counts taken 6/12/2007.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
alfalfa	3	0	1	3	0	0	0	0	0	1	3	2	0	2	1	0	0	2	0	0	**18**
cicer milkvetch	0	0	0	0	0	0	1	0	0	0	1	0	1	2	1	0	1	2	0	0	**9**
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	**1**
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
sainfoin	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	**2**
planted grasses	1	0	0	1	0	0	1	0	0	0	0	1	0	1	0	0	0	0	2	4	**11**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
rose	0	0	0	0	2	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	**6**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	20	20	80	80	80	80	60	50	80	40	40	40	40	60	40	60	10	30	30	30	**49**

Table 28. Old John's Lake WMA; introduced species seeded with no herbicide application. Random species counts taken 6/12/2007.

	FRAME (2.4-ft^2)																				
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**Total**
alfalfa	0	0	0	0	2	0	0	0	0	2	0	0	0	2	0	0	1	1	3	0	**11**
cicer milkvetch	0	0	0	0	1	0	2	0	0	5	3	1	0	2	0	0	0	0	0	0	**14**
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
sainfoin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
planted grasses	0	1	2	0	2	2	0	1	1	2	3	1	2	0	0	1	1	1	0	1	**21**
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
																					Avg
WEED CANOPY %	80	60	70	80	60	60	30	30	70	30	40	50	60	60	30	40	50	50	40	80	**54**

ACTIVE STUDIES - TECHNICAL REPORT 2007

Study No. NDPMC-S-0603-CR

Study Name: Wind Cave National Park

Introduction: U.S. Geological Survey (USGS) Northern Prairie Wildlife Research Center and the Natural Resources Conservation Service (NRCS) in North Dakota signed a cooperative agreement in September 2005. The USGS and National Park Service (NPS) are working to preserve the native plant resources and revegetate parklands. The USGS/NPS require that restoration of native plants be accomplished using germplasm from populations as closely related genetically and ecologically as possible to park populations. The Bismarck Plant Materials Center (PMC) has agreed to propagate seed of selected species and provide the seed to Wind Cave National Park (WICA) in the Black Hills of South Dakota for revegetation and further research. Table WI-1 lists the selected species, the amount of seed requested, and the amount of seed harvested through 2007 at the PMC.

Table WI-1.

Species	Common Name	Target lbs (PLS)	PMC Harvest 2006 & 2007 (Clean amount)	Units
Andropogon gerardii	Big bluestem	5	157	g
Aristida purpurea	Purple three awn	2	(dirty) 4	lb
*Bouteloua curtipendula**	Sideoats grama	5	No PMC planting	
Bouteloua gracilis	Blue grama	5	1	lb
Elymus elymoides	Bottlebrush squirreltail	2	12	lb
Koeleria macrantha	Prairie junegrass	2	5	lb
Nassella viridula	Green needlegrass	substitute	2.15	lb
Pascopyrum smithii	Western wheatgrass	5	13	lb
Schizachyrium scoparium	Little bluestem	5	4	lb
*Astragalus missouriensis**	Missouri milkvetch	.5	No PMC planting	
Circium undulatum	Wavyleaf thistle	.5	473	g
Dalea purpurea	Purple prairieclover	.5	39	g
Oxytropis campestris	Slender crazyweed	substitute	326	g
Oxytropis lambertii	Lambert's crazyweed	substitute	2	g
*Sphaeralcea coccinea**	Scarlet globemallow	.5	No PMC planting	

** Little or no seed was collected for these species. Those listed as substitutes have been grown and planted at the PMC along with the other targeted species.*

Accomplishments
2005: Wildland collections of seed were made by WICA personnel and shipped to the Bismarck PMC.
2006: Wildland collected seed was cleaned, propagated in the greenhouse and planted to field beds at the Bismarck PMC. Very small amounts of seed of a few species were harvested from PMC fields in the fall.
2007: Seed was harvested from PMC field plots of most species and cleaned. Production of some species met targeted goals.

Technology Developments
Seed cleaning and seed harvest methods were devised for many of the species. Additional data will be collected in 2008 regarding plant growth.

Materials and Methods
Details of the Accomplishments and Technology Development are found in the remainder of this report.

Seed Collection and Processing

Seed was collected by WICA personnel in the fall of 2005. Seed set was poor for some species due to drought conditions at WICA. Seed was collected from other species to substitute for those producing no viable seed and sent to the PMC. Seed was collected at WICA by clipping seed heads or hand stripping seed from the heads. Seed was cleaned at the PMC using a rub board, a column seed blower (South Dakota type), an office sized fanning mill, a laboratory debearder, and pan screens. Seed fill was poor for many of the species. Exact amounts of material received from WICA were not recorded as much of the weight was from sticks or other vegetative parts. The collections were not given an accession number (PMC ID number), as all material will be allocated back to WICA.

Greenhouse Propagation

Seed was propagated in the greenhouse at the PMC, with seed planting starting January 11, 2006. The seed of most species was planted into Cone-tainers™, which are plastic cones with bottom drainage holes. Each cone has a 1½ inch diameter and an 8¼ inch depth. Flats were also planted. Plants from the flats were used to transplant into cones where seed did not germinate. Premier Promix BX with biofungicide, a no-soil potting mix was used. The goal was to produce 200-400 seedlings of each species to be planted into a field plot. Seedlings were hardened off in the lath house prior to field planting.

Field Planting

2006: A field plot was prepared by tilling. A subsoiler was used to make a 10-12 inch deep trench in which the cone-tainerized seedlings were planted by hand. Moisture conditions were good at the time of planting and the field was irrigated after transplanting. Seedlings were planted in paired rows to help improve pollination. The rows were spaced approximately 4-5 feet apart. Four rows contained all of the species. Field row length was approximately 800 feet. Plants were spaced approximately 1 foot apart within the row. Seedlings for most species were planted to the field in early June 2006. Some of the forb and grass seedlings were very slow to grow in the greenhouse, so were planted to the field plot in early August when they had larger root systems.

Field Maintenance

2006: Weeds were controlled by shallow tilling with a garden tiller and hand weeding. No chemicals were applied. Weeds were removed throughout the growing season and were not a limiting factor for plant growth. Plant residue was left standing at the end of 2006. The seedlings were irrigated immediately after field planting and a few additional times from June through September to keep the plants alive in the severe drought and hot conditions of 2006.
2007: Residue from 2006 was cut with hand shears in April 2007. Weeds were controlled by hand tilling and weeding when weeds were small. The plants were not irrigated in 2007, as timely rains fell in the spring and early summer. There was no application of fertilizer, herbicide or insecticide on any of the plots. Purslane, pigweed, lambsquarter, and kochia were the predominant weeds.

Field Harvest

2006: Few seeds were harvested in 2006. Any seed harvested was gathered by hand.
2007: Seed was harvested by clipping heads, hand stripping seed from heads, straight combining, and clipping heads and then thrashing through a plot combine. Seed harvest was fair for most species. Only small amounts of seed were produced for *Oxytropis lambertii, Dalea purpurea*, and *Andropogon gerardii*. Seed harvested in 2006, 2007, and 2008 will be bulked together for each species and a purity and germination test run for each lot. See Table 1 for list of seed amounts harvested through 2007.

Species Performance

Andropogon gerardii (big bluestem)
2006: Approximately ¼ pound of dirty seed was received from WICA. Seed were cleaned using a debearder and fanning mill. Approximately 34.6 grams of clean bulk seed remained. Seed germinated readily in the greenhouse, but plants were of poor vigor. Cool greenhouse conditions and lack of proper

nutrients in the soil were contributing factors. Approximately 108 seedlings were planted to the field in August. Seedlings grew to about 4-5 inches tall in the field.
2007: Plants were vigorous and grew to 5 feet in height. Plants were very diverse in size, shape, and seed maturity. Seed culms were not abundant, but were produced on most plants. Seed heads were clipped on October 17. Many of the heads were green and many did not appear to be filled. Seed was cleaned using a debearder and fanning mill.

Aristida purpurea (purple three awn)
2006: Approximately 200 grams of seed with awns were received from WICA. This seed was very difficult to process. Awns could not be removed using a rub board. A scarifier removed a few awns, but not a high percentage. The seed tended to break using the scarifier. The majority of the seed for greenhouse planting had the awns removed by clipping with a scissors. Germination was rapid in the greenhouse (approximately 1 week). Seedlings (326) were planted to the field on June 8, 2006. Plants were healthy and vigorous. Roots appeared to be quite shallow. Several plants produced heads. Seed was harvested by hand stripping. Removal of awns was again a challenge. Seed was run in a scarifier and trash was removed by hand picking. Many of the seeds were not filled. Five grams of seed remained after cleaning. Quality of the cleaned seed was poor.
2007: Plants were vigorous and produced abundant seed heads. Seed ripening was uneven. Plant leaves were narrow and remained somewhat green until frost. Seed shattered with strong winds, but otherwise remained on the plant. Awns protruding from the seed are very fine and caryopses are fragile. These characteristics make cleaning very difficult. Attempts to debeard and hammermill broke the seed or rolled it into a dense wad. The Bismarck PMC has found no acceptable method of cleaning the seed at this time.

Bouteloua gracilis (blue grama)
2006: Blue grama was received from WICA as clipped heads. Approximately 35 grams of bulk seed remained after cleaning with pan screens and rub board. Seed germination was fair to poor in the greenhouse. Seedlings (242) were planted to the field on June 12, 2006. Approximately 90 percent of the plants produced seed heads. Seed was harvested by hand clipping the heads on September 26, 2006. Seed was cleaned using a fanning mill and debearder. Sticks were removed by blowing good seed over and dropping sticks through the screens. Harvesting only the seed head would have reduced the amount of sticks to remove. Seed fill was poor. Clean bulk seed yield was 100 grams.
2007: Plants in the field were vigorous and quite variable in size, flowering time, and seed head production. Seed was harvested at various dates starting August 10, 2008. Heads were hand stripped or clipped. Seed was cleaned using a small debearder and fanning mill. Seed fill was fair to poor. Hot temperatures during pollination may have been a factor.

Elymus elymoides (bottlebrush squirreltail)
2006: Seed heads were received from WICA. The curved awns were removed by hammer-milling. Approximately 37 grams of bulk seed remained after cleaning with a South Dakota seed blower. Seedlings (286) were planted to the field on June 8, 2006. Plants had a bunch type growth and were vigorous in the field. Various plants showed slight signs of leaf rust. Five seed heads were produced in 2006. None of the seed was viable.
2007: Plant growth was tremendous. Plants produced abundant forage and seed heads. Heads were large and lodged severely. Due to lodging, seed culms were hand clipped on July 16, 2007, and fed through a plot combine. Seed was cleaned using a debearder to remove the long awns and a fanning mill. Twenty-one pounds of combined material cleaned to 12 pounds of bulk seed. The plants showed little regrowth after harvest.

Koeleria macrantha **(**prairie junegrass**)**
2006: Seed of wildland collections was hand stripped and chaff was separated using pan screens. Approximately 30 grams of seed and chaff remained after stripping. The South Dakota seed blower did not separate seeds due to static. Several seeds per Cone-tainer™ were planted in the greenhouse in mid

January. Seed germination was good, and 3-5 seedlings grew in each cone. An attempt to thin the seedlings was not successful. Growth was not inhibited by multiple seedlings in each cone. Seedlings (479) were planted to the PMC field plot on June 12, 2006. No seed heads were formed. Deer browsed the species. Plants were vigorous and grew to 4 inches in height.
2007: Plant vigor was excellent. Each plant produced multiple seed heads. The average height of a plant, on June 6, 2007, averaged 20 inches. Anthers were just beginning to appear. Seed was harvested by hand clipping heads on July 9, 2007, and thrashing them through a plot combine. The small plot size, lodging of heavy heads, and short stature of some plants would have made direct combining difficult. Seed was cleaned using a hammermill and fanning mill. The embryo is not easily distinguished, making separation of chaff from viable seeds difficult. Plant growth and appearance varied among plants, but not significantly.

Nassella viridula (green needlegrass)
2006: The 13 grams of bulk seed received at the PMC had been hand stripped. Awns were removed using a rub board. Seed was also scarified a few seconds to scratch the seedcoat and reduce dormancy. Seed germination was fair. Seedlings were planted to the field on June 8, 2006. Plants were very vigorous in the field. Leaves grew to a length of 1 foot. No seed heads were produced in 2006.
2007: Plant growth was good. Seed was hand stripped as it became ripe from June 28 through July 24, 2007. Seed was cleaned using a debearder and fanning mill.

Pascopyrum smithii (western wheatgrass)
2006: Approximately 81 grams of clipped heads were received from WICA, producing 50 grams of clean bulk seed. Seed readily germinated and seedlings were healthy and vigorous at the time of field planting. Seedlings (360) were planted to the field on June 8, 2006. Rhizome spread and leaf growth were excellent in the field. No seed heads were produced in 2006.
2007: Plants had vigorous growth and rhizome spread and produced abundant seed heads. Seed was harvested on July 23, 2007, using a small plot combine. Thirteen pounds of bulk clean seed was cleaned from 28 pounds of combined material using a fanning mill.

Schizachyrium scoparium (little bluestem)
2006: Seed received from WICA was hand stripped from the plants. Awns were removed using a debearder. Empty seeds and debris were removed using a fanning mill. Approximately 50 grams of bulk seed remained after cleaning. Germination was fair and growth was good in the greenhouse. Seedlings (255) were planted to the field on June 12, 2006. Growth in the field was excellent. Plants were vigorous and produced seed heads. Seed was hand harvested in October 2006, which is later than normal for little bluestem but typical for first year plantings. Seed fill was poor. A total of 36 grams of clean bulk seed was produced.
2007: Plants were vigorous and produced abundant forage and seed heads. Seed was hand stripped from the plant using hair combs. Larger plots could be successfully harvested by mechanical seed stripping or combining. Plants showed some variability in size and color, but overall were fairly uniform. Fall color was very showy. Seed was cleaned using a debearder and fanning mill. Approximately 4 pounds of bulk seed remained after cleaning the 7 pounds of harvested material.

Circium undulatum (wavyleaf thistle)
2006: Seed was received from WICA in whole heads. Seeds were carefully removed from the spiny heads using a tweezers and rub board. The hairy appendages were pulled from the block shaped seed before planting in the greenhouse. Many of the seeds had insect holes. These seeds were removed using a South Dakota seed blower. Approximately 8 grams of bulk seed remained after cleaning. Seed in the greenhouse germinated within two weeks. Seedlings did not flourish in the greenhouse environment. Damping off became a problem. Pot size may have hampered growth, as well. Fifty-two seedlings were planted to the field. Once in the field, the plants thrived and grew into large rosettes reaching diameters of 1-2 feet. Plant spacing greater than 1 foot would have allowed for greater growth. As expected, this rosette forming species did not produce seed heads the first year. Plants were very spiny and vigorous.

2007: Plant growth was good in the field. Most plants produced seed heads. Seed ripened at various times. The first seed was harvested July13, 2007, and the last seed was harvested in mid August. Insects, including bees and beetles, were abundant on the heads throughout the season. Birds tore the side of the seed heads when seed were ripe. Heads were clipped by hand when the birds appeared and when the base started to brown and the tops fuzzed out white. Plant stems became hollow and died back by late August. The dead plant material was removed. New plant rosettes were found growing beneath some of the old plants. Seed was cleaned by hammer-milling the heads and running through a fanning mill. Beetles and their larvae were found in some of the seed. Seed fumigation may be necessary in the future.

Dalea purpurea (purple prairieclover)
2006: Material from WICA was received at the PMC as fluffy seed stripped from the heads. Seed fill was poor. Seeds appeared green and unripe. Less than 5 grams of bulk seed remained after cleaning. The fuzzy seed covering was removed using a rub board. The seed was scarified for 10-12 seconds using a Forsberg scarifier prior to greenhouse planting. The purpose of scarification was to scratch the coat and allow quicker water uptake by the seed. Seed germinated readily, but seedlings remained very small in the greenhouse and damping off became a severe problem. The biofungicide in the potting soil may have been a factor limiting growth. Seedlings (247) were planted to the field in early August. Most of the seedlings survived and grew after planting. No seed heads were produced.
2007: Plants were variable in size, but most remained small. Deer and rabbit browse was severe throughout the growing season. Seed heads were produced but most were browsed. Seed was hand stripped and cleaned using a debearder and South Dakota seed blower. Seed harvest was small.

Oxytropis campestris (slender crazyweed)
2006: Seed was received in pods from WICA. Seed was removed from the pods using a rub board and South Dakota seed blower. Approximately 18 grams of pods produced 5 grams of seed. Seed was scarified approximately 12 seconds before seeding in the greenhouse. Seedlings remained small in the greenhouse. Approximately 195 plants were planted to the field plot in August 2006. Seedlings in the field remained small, growing to 2-4 inches in heights.
2007: Plants were vigorous. Bees appeared to pollinate the pale purple flowers. Yellow is the most common flower color, so species identity is questionable and will be further investigated in 2008. Plants produced seed heads which were hand stripped July 16 and 30, 2007. Seed pods were processed through a debearder and hammermill. Chaff was separated using a fanning mill. A few seeds clung to the creased pods and were difficult to separate.

Oxytropis lambertii (lamberts crazyweed)
2006: Very little seed was received from WICA. All seed was planted in the greenhouse. Seed germination was poor. Seedlings (32) were planted to the field in August. Plants remained small, but did grow once in the field. Plants were prostrate in growth. No seed was produced in 2006.
2007: Plant growth was initially good. Plants were more upright than in 2006. Flower color was a bluish purple. Plants in the field began to die for unknown reasons soon after flowering in early July. The few seed pods that were produced were hand harvested and cleaned.

ACTIVE STUDIES - TECHNICAL REPORT 2007

Study No. NDPMC-S-0602-CR

Study Name: Little Bighorn Battlefield National Monument

Introduction: The National Park Service (NPS) has a need to preserve the native plant resources and restore the parkland of the Little Bighorn Battlefield National Monument (LIBI). The NPS requires that restoration of native plants will be accomplished using germplasm from populations as closely related genetically and ecologically as possible to the park populations. Quantities of native seed are needed to restore areas disturbed by construction activities for a proposed road rehabilitation project. The NPS has requested assistance from the Bismarck Plant Materials Center (PMC). The PMC has agreed to increase seed of four selected grass species collected at LIBI. Technical assistance in planting, growing and cleaning of seed will also be provided to LIBI. The agreement was signed in September 2005 and runs through FY 2008.

Targeted Species

Species	Common name	PLS lbs (goal)	2007 harvest (lbs)
Nassella viridula	Green needlegrass	100	2.88 (clean)
Pseudoroegneria spicata	Bluebunch wheatgrass	100	30 (clean)
Bouteloua curtipendula	Sideoats grama	50	36 (clean)
Bouteloua gracilis	Blue grama	10	4 (clean)

Methods and Materials

Seed was collected by LIBI personnel in 2005 and sent to the PMC in the fall for cleaning and increase. The seed was cleaned using a two-screen office size fanning mill, a small debearder with rubber bats and rubber corrugated lining, and pan screens. Each species of seed was assigned an accession number (identification number). Seed germination and purity were tested by the North Dakota State Seed Department. Cleaned seed of green needlegrass was planted at the Bismarck PMC in late fall of 2005. The other grasses were planted in the spring of 2006. The seedbeds were black and had been firmed (packed) prior to seeding. Seed was planted using a modified Truax grass drill with 42-inch row spacing. Blue grama seed, which was very limited, was planted using a plot seeder with 8 inch row spacing. Fields were maintained by hand weeding, tillage, irrigation and herbicide application. Approximately 100 seedlings were grown in the greenhouse for each of the targeted species. These were transplanted to the field to fill in gaps in some of the rows. Seed produced in any of the fields in 2006 was harvested by hand. Following are details related to seed increase activities for each grass.

Green needlegrass: accession 9092048
Collected seed: Dirty weight = 7.7 lbs; bulk after cleaning = 4.5 lbs.
Seed cleaning: Debearder and a two-screen office fanning mill. The debearder speed was 160 rpm for 15 minutes. The office mill screen sizes were #9 round on top and a 1/22 bottom screen, with air ½ open.
Seed quality: Purity: 97.09%; Germination: 2%; Dormancy: 86%.
Seeding date: November 23, 2005. Due to high dormancy, seed was planted in late fall.
Site preparation: The field was cultivated and packed. Trust (trifluralin) herbicide was applied at 2 pints/ac and incorporated prior to seeding. Field conditions were very moist at the time of seeding.
Seeding: Seeding rate was approximately 50 seeds (bulk)/linear foot. Eight rows, approximately 800 feet long, were planted on 42-inch row spacing. The field had little snow cover over the winter so little moisture was available in the spring of 2006.
Maintenance: In 2006, the field was hand weeded and irrigated. Broadleaf weeds were sprayed with 2,4-D at 2 pints/ac on August 10 and August 21, 2006. In the fall, the tops of the weeds were clipped to prevent further seeding of weeds. On April 2, 2007, the field was fertilized with 23-37-00 at around 80 lbs/ac of actual N. On April 23, Pendant (pendimethalin) herbicide was applied at 1.8 pints/ac. On May 7 and on June 20, Curtail (clopyralid+2,4-D) herbicide was applied at 2 pints/ac. On August 15, 2,4-D herbicide was

applied. The field was also cultivated, roto-tilled and hoed by hand periodically during the summer of 2007. After the field was roto-tilled, loose soil was raked off the newly emerged seedlings.
Plant performance: Stand was poor in the spring of 2006 and remained poor throughout the growing season. The field had some rows with stretches of good plants, while other plants were widely scattered. Broadleaf weeds were a problem. In the spring of 2007, growing conditions were much improved. The rainfall from April through June was about three times as much as was received in the same period in 2006. Much more seed germinated and a good stand has developed. Newly germinated plants remained vegetative in 2007.
Harvest: No harvest in 2006. In 2007, seed was harvested periodically by hand, beginning on June 27. Seed was primarily harvested from plants which had germinated in 2006. The plants that first emerged in the spring of 2007 did not produce seed. Clean seed harvested in 2007 totaled 2.88 lbs.

Bluebunch wheatgrass: accession 9092050
Collected seed: Dirty weight = 6.4 lbs; bulk after cleaning = 3.9 lbs.
Seed cleaning: Debearder and a two-screen office fanning mill. Seed was run in the debearder for 10 minutes. A #14 round screen was used as a top screen and a blank was used on the bottom. Wind was ¼ to ½ open.
Seed quality: Purity: 90.2%; germination: 90%.
Seeding date: May 4, 2006
Site preparation: The site was prepared by cultivation and packing. The herbicide Trust (trifluralin) was applied at 2 pints/ac on May 2, 2006, just prior to seeding. The field was black and soil moisture was fair at the time of planting.
Seeding: Seeding rate was approximately 40 seeds (bulk) per linear foot of row. Eight rows about 800 feet long were seeded on 42-inch centers.
Maintenance: In 2006, the field was hand weeded and irrigated throughout the growing season. No additional chemicals were applied after seeding.
On April 2, 2007, the field was fertilized with 23-37-00 at about 80 lbs/ac of actual N. On April 23, Pendant herbicide was applied at 1.8 pints/ac. On April 26, Tilt fungicide at 4 oz/ac was applied. On May 7, Curtail herbicide was applied at 2 pints/ac. Two pints/ac of 2,4-D was applied on July 17 and August 15. Some hand hoeing and spot spraying was also done during the growing season.
Plant performance: During 2006, broadleaf weeds were severe in some portions of the field. Stand was spotty. Plants remained small and very few seed heads were formed. Plant growth was slow and plants remained short. Plants were larger in areas where weeds were not so competitive. With improved growing conditions in 2007, a better stand developed. Most of the field was very clean. In one area where weed cover was especially thick in 2006, the grass stand remained poor in 2007. Following the harvest, the field did not green up much with cooler fall temperatures.
Seed harvest: No seed was harvested in 2006. On July 9, 2007, 55 lbs of seed was harvested with a Wintersteiger combine. The cleaned weight was 30 lbs.

Blue grama: accession 9092047
Collected seed: Dirty weight = 341 grams; bulk after cleaning = 51 grams. Most collected seed was empty.
Seed cleaning: Debearder and office fanning mill. Seed was run in the debearder for 10 minutes at 160 RPM. Office mill screen sizes were #12 round on top and a blank for the bottom screen. Air was ¼ to ½ open.
Seed quality: No seed tests were run. Hand cutting seed showed a fill of 80% or greater for the cleaned seed.
Seeding date: June 2, 2006
Site preparation: The field was prepared by cultivating and packing. Atrazine herbicide was applied at 2 pints/ac on May 19, 2006.
Seeding: A plot seeder was used to plant a field bed of about 800 square feet. The bed consists of 8 rows with 8-inch spacing. The seed was planted at a rate of about 1 gram of bulk seed per 30 linear feet of row.
Maintenance: The field was hand weeded and irrigated in 2006. No herbicide, other than the Atrazine prior to planting, was applied to the field. In 2007, the field was hand rogued.
Plant performance: An excellent stand developed in 2006. Due to narrow spacing, weed competition was very minimal. The plants were vigorous and produced numerous seed heads. Maturity of seed was late in

the field. Seed maturity is often variable the first year. However the seed fill was poor, due to hot, dry conditions. In 2007, the excellent growing conditions encouraged a better seed fill.

Seed harvest and cleaning: On September 28, 2006, the seed was harvested by hand clipping the heads. The seed was cleaned using a hammer mill, debearder and fanning mill. Fanning mill screens were #12, #11, #10, and #8 round. Seed was run in a small debearder for 10-15 minutes. Sticks were difficult to remove from the seed. Harvesting by clipping stems is not the best method. Three lbs of clean, bulk seed was harvested in 2006. On August 24, 2007, 7.5 lbs was harvested from the field with the Wintersteiger combine. The weight of clean seed was 4 lbs.

Sideoats grama: accession 9092049
Collected seed: Dirty weight = 4.75 lbs; bulk after cleaning = 1.8 lbs.
Seed cleaning: Office fanning mill, with screen sizes #20 and #24 round on top and a blank on the bottom.
Seed quality: Purity: 97.93%; Germination: 26%; Dormancy: 15%.
Seeding date: May 30, 2006
Site preparation: The field was prepared by cultivating and packing. Atrazine was applied at 2 pints/ac on May 19, 2006.
Seeding: Seed was planted at a rate of 49 bulk seeds per linear foot of row. A modified Truax grass drill was used to plant 6 rows spaced on 42-inch centers, for a length of about 800 feet. The seed fed slowly through the drill, so both the fluffy box and the cool-season boxes were used.
Maintenance: In 2006, the field was hand weeded and irrigated. No herbicide was applied following the seeding. Rows were shallow tilled to control small weeds. In 2007, the field was worked with the two-row tiller. In June 2007, Atrazine was applied at 2 pints/ac. The field was also rogued several times during the growing season.
Plant performance: In 2006, the stand was spotty, but overall was fair. Plants were vigorous and produced some seed heads. By 2007, a much better stand had developed.
Seed harvest and cleaning: On September 28, 2006, the ripe seed was hand stripped. Flowering was very late and much of the seed was still green at the time of frost. Seed maturity was quite variable, which is common for first year seedlings. The seed was cleaned using the office-size fanning mill with # 20 and #24 round screens on the top and a blank on the bottom. Much of the seed was not filled. Dirty seed amount was 5.5 lbs; clean weight was 1.4 lbs. In 2007, the seed was harvested with the Wintersteiger combine on August 1. Dirty weight totaled 54 lbs; clean weight was 36 lbs. The purity was 96.09%; germination was 35%; dormancy was 44%.

ACTIVE STUDIES - TECHNICAL REPORT 2007

Study No. NDPMC-S-0704-CR

Study Name: Theodore Roosevelt National Park

Introduction: The National Park Service (NPS) has a need to preserve the native plant resources and revegetate disturbed park lands. The NPS requires that restoration of native plants will be accomplished using germplasm from populations as closely related genetically and ecologically as possible to the park populations. Quantities of native seed are needed to revegetate areas disturbed by construction activities for the proposed road rehabilitation project. The NPS has requested assistance from the Bismarck Plant Materials Center (PMC). The PMC has agreed to increase seed of six selected grass species collected at Theodore Roosevelt National Park. Technical assistance for planting, growing and cleaning of seed will also be provided to the park. The interagency agreement was signed in May 2007, and runs through FY 2010.

Targeted Species and Amounts:

Species	Common name	PLS pounds
Nassella viridula	green needlegrass	100
Pascopyrum smithii	western wheatgrass	200
Elymus trachycaulus	slender wheatgrass	100
Bouteloua curtipendula	sideoats grama	100
Bouteloua gracilis	blue grama	10
Koeleria macrantha	prairie junegrass	5

Accomplishments

2007: Seed was collected throughout the summer and fall by park staff. On July 26, 2007, Theodore Roosevelt National Park staff along with staff from the Natural Resources Conservation Service spent a day collecting seed at the park. All seed was inventoried at the Bismarck PMC and will be cleaned, tested, and used in the planting of seed increase fields at the PMC. Each species of seed was assigned an accession number (identification number). Seed germination and purity will be tested by the North Dakota State Seed Department. The green needlegrass was dormant planted on November 30, 2007. All of the other species except prairie junegrass will be seeded in the spring of 2008. The prairie junegrass seed will be planted in the greenhouse with a goal of 500 plants that will be planted into a prepared site in late May. Following are details related to seed increase activities for each grass species.

Green needlegrass: accession 9092171

Collected seed: Dirty weight = 4.4 lbs; bulk after cleaning = 2.8 lbs.
Seed cleaning: Debearder and a two-screen office fanning mill. The debearder speed was 160 rpm for 15 minutes. The office mill screen sizes were #9 round on top and a 1/22 bottom screen, with air ½ open.
Seed quality: Purity: 92%; Germination: 2%; Dormancy: 72%.
Seeding date: November 30, 2007. Due to high seed dormancy, seed was planted in late fall. The planting is located in panel G-4 on the southwest side.
Site preparation: The field was cultivated and packed. No pre-plant herbicides were used. Field conditions were good with a firm seedbed. Soil moisture was dry at the surface and frozen below the 3-inch depth approximately. Air temperatures were in the teens at the time of seeding.
Seeding: Seeding rate was approximately 50 seeds (bulk)/linear foot. Fourteen rows, approximately 424 feet long were planted on 42-inch row spacing (0.48 acre). A modified Truax grass drill was used for the planting. The seed was planted at a depth of ½ inch. The field received approximately 2 to 3 inches of snow cover the day after planting.

Western wheatgrass: accession 9092172
Collected seed: Dirty weight = 17.68 lbs; bulk after cleaning = 3.25 lbs.
Seed cleaning: Hammer mill and a two-screen office fanning mill. The material was first run through a hammer mill to break the seed from the stem. The material was hammer-milled twice. The first run was with a ¼-inch screen size. The second run was through a 3/16-inch screen. The office mill screen sizes were 1/12 x 1/2 on top and a blank screen on the bottom for the first run. The second run used a 1/14 x 1/4 screen on top and a blank on the bottom. The side plate setting was ¼ open on both runs.
Seed quality: Purity: 92.24%; Germination: 87%; Dormancy: 0%.

Slender wheatgrass: accession 9092175
Collected seed: Dirty weight = 3.59 lbs; bulk after cleaning = 854 grams.
Seed cleaning: Hammer mill and two-screen office fanning mill. The seed was initially run through a hammer mill to separate seed from the stems. A ¼-inch screen size was used on the hammer mill and a slow speed was used. The material was fed at full rate. The material was hammer-milled twice. The seed was then run through an office mill twice. The first run used a #12 screen size for the top screen and a blank screen was used on the bottom. A #10 screen size was used as the top screen with a blank screen being used on the bottom for the second run. The side plate setting on the office mill was ¼ open for both runs. A seed sample was sent in to the seed testing lab and is waiting purity and germination tests.
Seed quality: Pending

Blue grama: accession 9092173
Collected seed: Dirty weight = 1.4 lbs; bulk after cleaning = 188.1 grams
Seed cleaning: Debearder and two-screen office fanning mill. The seed was processed through a debearder for 10 minutes before being run through a small office mill. The screens used were a #10 screen for the top screen and a blank screen on the bottom. The seed was then hand screened to remove the larger sticks. A sample was sent to the seed testing lab and is waiting for germination and purity results.
Seed quality: Pending

Sideoats grama: accession 9092174
Collected seed: Dirty weight = 3.6 lbs; bulk after cleaning = 2.8 lbs
Seed cleaning: Two-screen office fanning mill. The top screen was a #20 screen size and the bottom screen was a blank. The side plate air setting ¼ open. A sample of the seed was sent in for purity and germination and results are pending.
Seed quality: Pending

Prairie junegrass: accession 9092176
Collected seed: Dirty weight = 0.98 lbs; bulk after cleaning = 56.6 grams.
Seed cleaning: Hammer mill and two screen office fanning mill. The materials was hammer-milled twice using a 3/32 screen size for both runs and a slow speed at full rate of feed. The seed was run through a two-screen office mill twice using a 1/12 top screen and a blank bottom screen for both runs. The air speed (rpm) was slow and the side plate setting was closed.
Seed quality: No seed tests were done.

ACTIVE STUDIES - TECHNICAL REPORT 2007

Study No. NDPMC-S-0705-CR

Study Name: Badlands National Park

Introduction: The Bismarck Plant Materials Center (PMC) entered into a cooperative agreement in May 2007 to provide seed and technical information needed for revegetation of areas disturbed by construction activities of FLHP PMIS 78257, Rehab Loop Road Phase III and IV in the Badlands National Park in South Dakota. The agreement is between the National Park Service, Badlands National Park of the U.S. Department of Interior, and the USDA, Natural Resources Conservation Service. This agreement is in effect from FY 2007 through FY 2010. The Bismarck Plant Materials Center (PMC) has agreed to produce native grass seed of five species collected in the Park by Park personnel and PMC staff. The seed produced at the PMC will be distributed to the Park for their revegetation work. Following is Table BA-1 listing the species and seed amounts requested.

Table BA-1.

Species	Common name	PLS pounds
Nassella viridula	green needle grass	100
Pascopyrum smithii	western wheatgrass	200
Elymus trachycaulus	slender wheatgrass	100
Bouteloua gracilis	blue grama	10
Sporobolus cryptandrus	sand dropseed	5

2007 ACCOMPLISHMENTS:
Seed of the five targeted species was collected by Park and PMC staff. Each of the species collected was assigned an accession number by PMC staff for identification and tracking purposes. This seed is currently being cleaned by staff at the Bismarck PMC. Once a lot is cleaned, a seed sample will be taken and sent to the NDSU Seed Testing Laboratory located at Fargo, North Dakota, for purity and germination tests. See Table BA-2 for seed amounts and completed test results.

Table BA-2.

Accession number	Species	Targeted bulk seed collection weights (lbs)	Dirty seed collected weight (lbs)	Clean seed weight (lbs)	Purity (%)	Germination (%)			Pure live seed weight available for seeding (lbs)	Planted field size (ac)
						Germ (%)	Dormant (%)	Total (%)		
9092167	green needlegrass	5.4	2.08	1.75	99.91	4	92	96	1.68	0.41
9092165	western wheatgrass	22.0	20.86	8.25	85.40	83	2	85	5.99	
9092166	slender wheatgrass	4.0	4.41	TBD						
9092168	blue grama	1.8	0.99	TBD						
9092169	sand dropseed	0.2	0.22	TBD						

A 0.41-acre field of green needlegrass was planted as a dormant seeding on 11/30/2007 in Panel G-4 at the PMC. The seedbed was prepared using a small 6-foot S-tined cultivator and spring tooth harrow. The field was firmly packed with a Brillion packer and seeded in 42-inch rows with a modified Truax grass drill. Seedings of western wheatgrass, slender wheatgrass, blue grama, and sand dropseed are planned for May 2008.

CONSERVATION FIELD TRIALS

CONSERVATION FIELD TRIALS: TECHNICAL REPORT 2007

Number and Title: NDPMC-F-0701-PA Grass/Legume/Forb Demonstration, Wessington Springs, South Dakota

Objective: Compare performance differences among species and varieties of various grasses, forbs, and legumes. The site will be used for education and demonstration and is open for public viewing.

Date Seeded: May 15, 2007

Cooperators: Jerauld County Conservation District and the USDA-NRCS, Wessington Springs, South Dakota

Methods and Materials: There are fifty-one plots of various grasses, legumes, forbs, and mixtures of each. They were seeded with a 6-foot plot drill. The drill consisted of a cone-seeder attachment for each opener so individual rows were metered separately. Plot size is 12' by 48' with 16 rows per plot for the grass plots. The forb and selected legumes plots were 28' in length and the same width. There are 6' borders separating each plot and larger borders on the ends. These areas were seeded to Bad River blue grama. Two larger plots about ½-ac each along the sides of the demonstration area were seeded to an introduced and a native mixture. The south side plot was seeded to an introduced mixture of 35% Reliant intermediate wheatgrass, 35% Fleet meadow bromegrass, and 30% Travois alfalfa. The north side plot was seeded to a native mixture of 10 species at 10% each. These included Bonilla big bluestem, Bad River blue grama, Lodorm green needlegrass, Tomahawk Indiangrass, Badlands little bluestem, needle-and-thread, Goshen prairie sandreed, Pierre sideoats grama, Forestburg switchgrass, and Rodan western wheatgrass. See Figure WS-1 for plot layout.

Site Information: The site was previously planted to alfalfa. The soils are a Lane silty clay loam and the Ecological Site Description is Clayey. The site is level. The property is owned by the Jerauld Conservation District and is located on the north edge of Wessington Springs, South Dakota adjacent to a county highway. The land was sprayed and tilled in 2006. A seedbed was prepared in the spring of 2007 by cultivating, harrowing, and roller packing. Above average rainfall was received in April and May. The plots and borders were mowed twice for weed control during the growing season.

Table WS-1. Plant performance at the Jerauld County Demonstration Site.

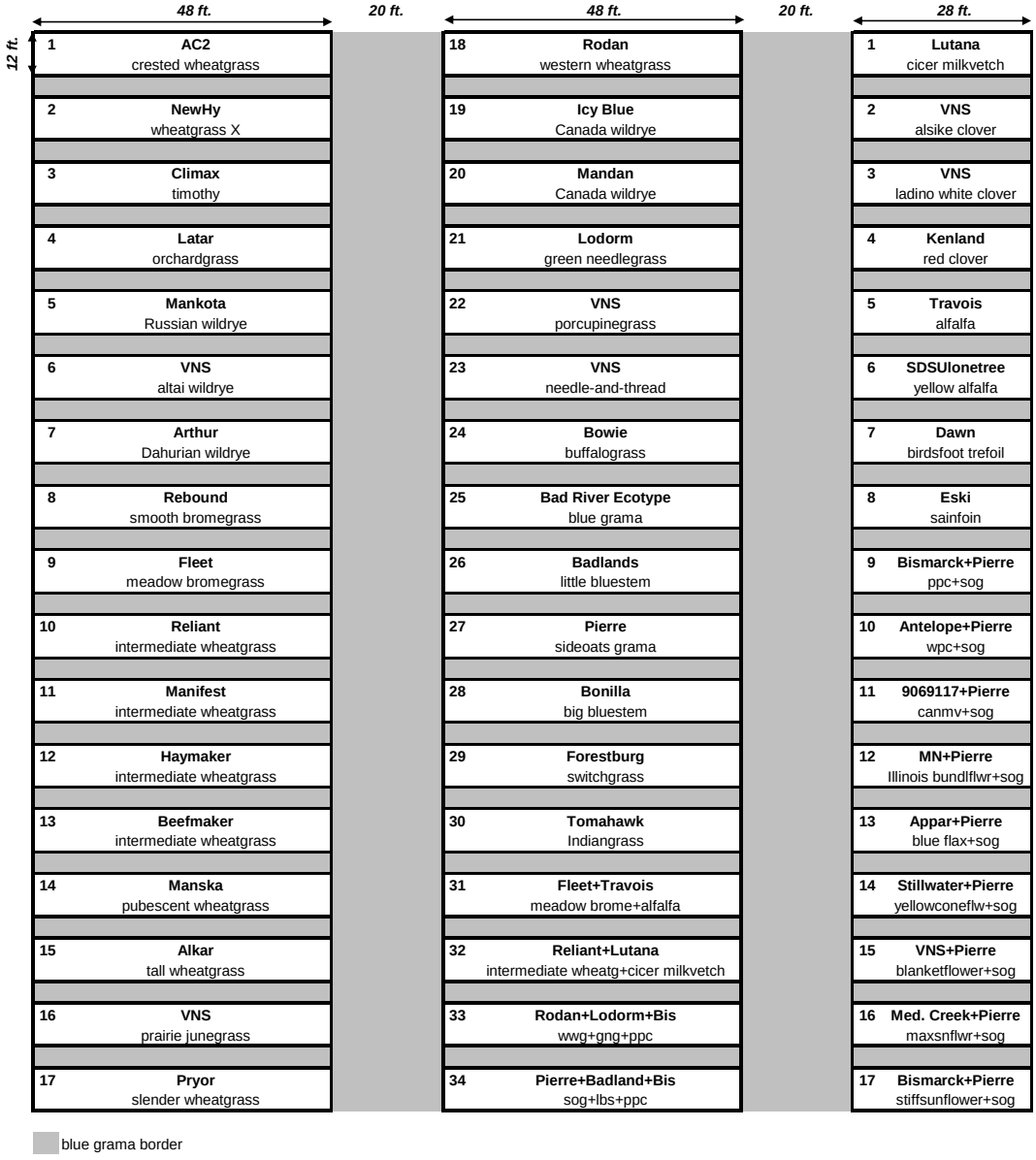
Common name/Variety (VNS=variety not stated)	(1) Weed Competition	(2) Stand Rating	(3) Vigor
Crested wheatgrass/AC2	3	4	2
Wheatgrass hybrid/NewHy	2	2	1
Timothy/Climax	6	7	3
Orchardgrass/Latar	5	5	3
Russian wildrye/Mankota	4	4	2
Altai wildrye/VNS	5	3	2
Dahurian wildrye/Arthur	1	2	1
Smooth bromegrass/Rebound	2	2	1
Meadow bromegrass/Fleet	2	2	1
Intermediate wheatgrass/Reliant	2	2	1
Intermediate wheatgrass/Manifest	3	3	3
Intermediate wheatgrass/Haymaker	2	2	1
Intermediate wheatgrass/Beefmaker	2	2	1
Pubescent wheatgrass/Manska	3	3	2
Tall wheatgrass/Alkar	2	2	3
Prairie junegrass/VNS	8	8	NA
Slender wheatgrass/Pryor	4	4	4
Western wheatgrass/Rodan	3	4	2

Canada wildrye/Icy Blue	3	4	4
Canada wildrye/Mandan	3	2	2
Green needlegrass/Lodorm	3	3	3
Porcupinegrass/VNS	5	6	5
Needle-and-thread/VNS	4	4	4
Buffalograss/Bowie	2	2	1
Blue grama/Bad River	3	3	3
Little bluestem/Badlands	5	5	4
Sideoats grama/Pierre	3	3	3
Big bluestem/Bonilla	4	4	4
Switchgrass/Forestburg	5	4	5
Indiangrass/Tomahawk	5	5	4
Meadow brome (Fleet)+ alfalfa (Travois)	2	2	2
Intermediate (Reliant) + cicer (Lutana)	2	2	2
Western (Rodan) + green needle (Lodorm) + purple prairieclover (Bismarck)	4	4	4
Sideoats (Pierre) + little blue (Badlands) + purple prairieclover (Bismarck)	4	4	4
Cicer milkvetch/Lutana	4	4	3
Alsike clover/VNS	2	2	2
Ladino white clover/VNS	4	4	3
Red clover/Kenland	3	2	2
Alfalfa/Travois	2	2	2
Yellow alfalfa/SDSU	3	3	3
Birdsfoot trefoil/Dawn	2	2	2
Sainfoin/Eski	2	3	3
Sideoats (Pierre) + Purple prairieclover (Bismarck)	4	4	4
Sideoats (Pierre) + White prairieclover (Antelope)	4	4	4
Sideoats (Pierre) + Canada milkvetch (9069117)	4	6	4
Sideoats (Pierre) + Illinois bundleflower (MN)	4	4	4
Sideoats (Pierre) + Blue flax (Appar)	4	4	4
Sideoats (Pierre) + Yellow coneflower (Stillwater)	5	5	5
Sideoats (Pierre) + Blanketflower (VNS)	4	4	4
Sideoats (Pierre) + Maximillian sunflower (Medicine Creek)	5	5	5
Sideoats (Pierre) + Stiff sunflower (Bismarck)	4	4	4

08/24/07, 1 = no weeds, 9 = all weeds
08/24/07, 1 = highest, 9 = lowest
08/24/07, 1 = highest, 9 = lowest

Results and Discussion: The plots were off to a good start after seeding. Evaluation ratings were taken on August 24, 2007, on stand, vigor, and weed competition. See Table WS-1 for results. NewHy hybrid wheatgrass, Arthur Dahurian wildrye, Rebound smooth bromegrass, Fleet meadow bromegrass, Alkar tall wheatgrass, Mandan Canada wildrye, and all of the intermediate wheatgrass varieties established well and had stand ratings of 2. Bowie buffalograss also looked very good and was the only warm-season entry to have an initial stand rating of 2. Climax timothy and prairie junegrass did not establish well. Comparing the legumes, alsike clover, Kenland red clover, Travois alfalfa, and Dawn birdsfoot trefoil were off to a good start and had stand ratings of 2. The forb plantings (with sideoats grama) and the grass/legume mixtures generally had stand ratings of 4 to 6 and were slower to establish. Weed competition and vigor ratings varied considerably across all plots. The larger sized native and introduced mixture plots seeded on the north and south ends, established well.

Figure WS-1. Plot layout of grass/forb demonstration at Wessington Springs, South Dakota, planted 5/15/2007.



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CONSERVATION FIELD TRIALS: TECHNICAL REPORT 2007

Number and Title: SDPMC-F-0703-PA Grass/Legume/Forb Demonstration, Bison, South Dakota

Objective: Compare performance differences and compatibility among various grass and legume species for grazing and hayland use. Various forb and shrub species will also be tested. The site will be used for education and demonstration and is open for public viewing.

Date Seeded: April 30, 2007

Cooperators: Perkins County Conservation District, Tatanka Resource Conservation and Development, USDA Farm Service Agency, and USDA, Natural Resources Conservation Service, Bison, South Dakota.

Methods and Materials: There are forty-two plots of various grasses, legumes, forbs, and mixtures of each. They were seeded with a 6-foot plot drill. The drill consisted of a cone-seeder attachment for each opener so individual rows were metered separately. Plot size is 12' by 57' with 16 rows per plot for the grass plots. A border area around and between the two sets of plots was seeded to Bad River blue grama. See Figure BI-1 for plot layout.

Site Information: The site was previously seeded small grains; the surrounding land was seeded to an introduced grass mix for CRP. The soils are a Reeder loamy. The site is level. The property is owned by Jim Lyon and is located on the south side of Highway 20 about 25 miles east of Bison, South Dakota. A seedbed was prepared in the spring of 2007 by cultivating and harrowing. Rainfall was received after seeding but amounts were marginal for good germination. The summer was dry and below average for precipitation. The plots and borders were mowed once for weed control during the growing season. Russian thistle and foxtail were the main weed species.

Table BI-1. Plant performance at the Perkins County Demonstration Site.

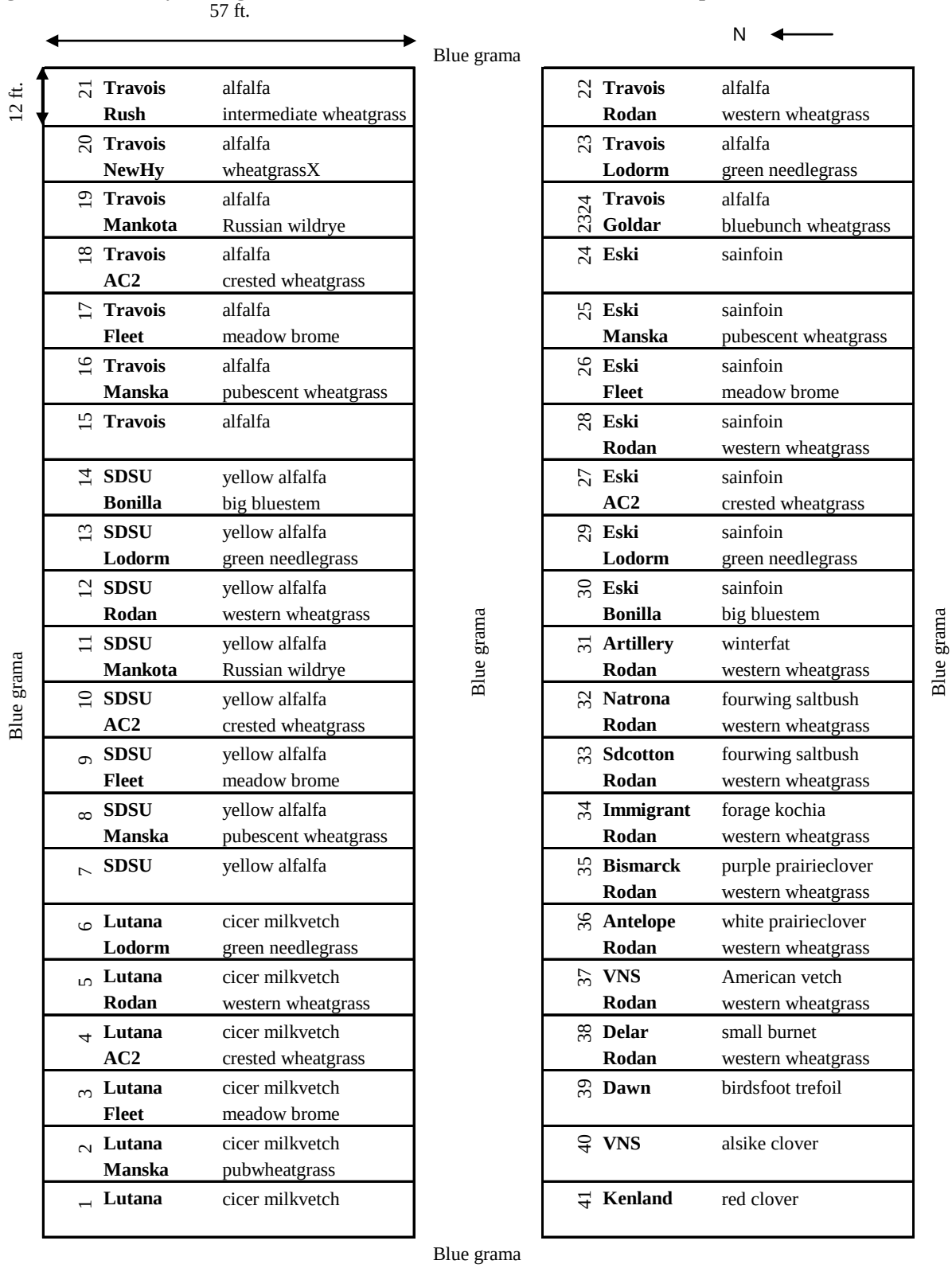
Common name/Variety (VNS=variety not stated)		(1) Stand Rating	
Lutana cicer milkvetch		8	
+ Manska pubescent wheatgrass		8+6	
+Fleet meadow bromegrass		8+5	
+AC2 crested wheatgrass		8+4	
+Rodan western wheatgrass		8+7	
+Lodorm green needlegrass		8+7	
SDSU yellow blossom alfalfa		6	
+Manska pubescent wheatgrass		6+5	
+Fleet meadow bromegrass		5+4	
+AC2 crested wheatgrass		5+4	
+Mankota Russian wildrye		5+5	
+Rodan western wheatgrass		5+7	
+Lodorm green needlegrass		6+7	
+Bonilla big bluestem		5+7	
Travois alfalfa		5	
+Manska pubescent wheatgrass		5+5	
+Fleet meadow bromegrass		5+5	
+AC2 crested wheatgrass		3+5	
+Mankota Russian wildrye		4+4	
+NewHy hybrid wheatgrass		4+4	
+Rush intermediate wheatgrass		4+6	
+Rodan western wheatgrass		6+8	
+Lodorm green needlegrass		6+6	

+Goldar bluebunch wheatgrass		6+6	
Eski sainfoin		4	
+Manska pubescent wheastgrass		4+5	
+Fleet meadow bromegrass		4+4	
+Rodan western wheatgrass		4+5	
+AC2 crested wheatgrass		4+5	
+Lodorm green needlegrass		4+8	
+Bonilla big bluestem		6+7	
Artillery winterfat + Rodan western wheatgrass		8+8	
Natrona fourwing saltbush + Rodan western wheatgrass		8+8	
SD fourwing saltbush + Rodan western wheatgrass		7+8	
Immigrant forage kochia + Rodan western wheatgrass		6+8	
Bismarck purple prairieclover + Rodan western wheatgrass		9+8	
Antelope white prairie clover + Rodan western wheatgrass		8+7	
VNS American vetch + Rodan western wheatgrass		9+8	
Delar small burnet + Rodan western wheatgrass		6+7	
Dawn birdsfoot trefoil		6	
VNS alsike clover		7	
Kenland red clover		7	

(1) 07/27/07; 1 = highest, 9 = lowest

Results and Discussion: The plots were off to a slow start after seeding primarily due to low rainfall. Evaluation ratings were taken on July 27, 2007, on stand ratings. See Table BI-1 for results. The main weed competition was Russian thistle and foxtail. Weed competition and vigor ratings varied considerably across all plots. The legumes with the highest stand ratings were both alfalfas and sainfoin. The best grass stands were pubescent wheatgrass (Manska), crested wheatgrass, hybrid wheatgrass, Russian wildrye, and meadow bromegrass. The shrubs and other legumes were rated poor.

Figure BI-1. Plot layout of grass/forb demonstration at Bison, South Dakota, planted 4/30/2007.



RELEASES

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D.C.

and

THE UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
Washington, D.C.

And

THE NORTH DAKOTA AGRICULTURAL EXPERIMENT STATION
NORTH DAKOTA STATE UNIVERSITY
Fargo, North Dakota

ANNOUNCE

THE RELEASE OF 'MANIFEST' INTERMEDIATE WHEATGRASS

'Manifest' intermediate wheatgrass [Thinopyrum intermedium (Host) Barkw. & D.R. Dewey subsp. intermedium] is being released jointly by the USDA-Agricultural Research Service, the USDA-Natural Resources Conservation Service, and the North Dakota Agricultural Experiment Station. Manifest was designated as Mandan I1871 in performance testing.

Manifest is a 12-clone synthetic selected at the USDA-ARS Northern Great Plains Research Laboratory, Mandan, ND from 10 accessions collected by the late Douglas R. Dewey (USDA-ARS, Logan, Utah) near Stavropol and Svetlograd, in the Caucasian region of Russia. The collection sites have a climate similar to the northern Great Plains of North America and a long history of grazing by sheep and goats. Parent clones of Manifest were selected based on performance of their respective polycross progenies in replicated tests used to measure forage yield, seed yield, spring recovery, and resistance to leaf-spot disease caused primarily by Cochliobolus sativus (Ito & Kuribayoshi) Drechs. Ex Dastur.

Manifest has exhibited consistent high forage yield over a wide geographic area and improved persistence under grazing compared with current cultivars. Disease problems have not been observed in regional tests, where overall levels of infection at individual sites were light to moderate. In vitro dry matter digestibility and crude protein levels of Manifest have averaged slightly lower than several other current intermediate wheatgrass cultivars, but nutritive quality was adequate for all classes of beef cattle.

Manifest is recommended in grass and grass-legume mixtures for hay and grazing in areas of the northern and central Great Plains and the Intermountain West where annual precipitation averages more than 350 mm (14 inches). Manifest also has potential as a perennial crop for cellulosic biomass in northern areas adapted to cool-season grass production.

Breeder seed of Manifest will be maintained by USDA-ARS, Northern Great Plains Research Laboratory, Mandan, ND 58554. One generation each of Foundation and Certified seed beyond Breeder seed is authorized. Foundation seed will be available from the USDA-NRCS Bismarck Plant Materials Center, 3308 University Drive, Bismarck, ND 58504.

The release date for Manifest will be on the date of final signature.

J.R. Flores, State Conservationist, North Dakota
USDA-Natural Resources Conservation Service
Bismarck, North Dakota

9-24-2007

Diane Gelburd, Director
Ecological Sciences Division
USDA-Natural Resources Conservation
Washington, D.C.

Kenneth F. Grafton, Director
North Dakota Agricultural Experiment Station
North Dakota State University
Fargo, North Dakota

K. Simmons, Acting DA

Judith St. John, Deputy Administrator
Agricultural Research Service
U.S. Department of Agriculture

SEED PRODUCTION

Accession: 'Nordan'
Name/Species: Crested wheatgrass, *Agropyron desertorum*
Location: Minot Experiment Station
Year of Establishment: 1999
Origin/Source: Selected at USDA, ARS, Mandan, ND

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
2000	Common	*	2004975	3	1225	87.25	94	0	12.63	0.04	0.08	1/22/2001
2001	Foundation	S0113586	2112669	3	523	96.3	91	0	3.66	0.02	0.02	4/29/2002
2002	Foundation	S0210283	L2204714	3	541	94.05	89	0	5.93	0.02	0	1/6/2003
2003	Foundation	C54968	L2305433	3	200	91.39	88	0	8.57	0	0.04	1/28/2004
2004		S0412380	L2409683	3	134	91.42	89	0	8.06	0.44	0.08	3/23/2005
2005	No harvest											
2006	No harvest											
2007	No harvest											

*Seedlot contained quackgrass, failed certification

Accession: 9076705
Name/Species: leadplant, *Amorpha canescens*
Location: Field D-11
Year of Establishment:
Origin/Source: North Dakota (Sioux County, Burleigh County)

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
2003	breeder		no test	0.05	6.0							
2004	breeder		no test	0.05	9.0							
2005	breeder		no test	0.05	7.5							
2006	breeder		no test	0.05	6.0							
2007	removed											

Accession: 'Bison' (NDG-4, 9005667, PI-477994)
Name/Species: big bluestem, *Andropogon gerardii*
Location: Field E-8
Year of Establishment: 1997
Origin/Source: Oliver County, North Dakota; USDA, ARS, Mandan, North Dakota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date	Notes
1998	Foundation	980067-1	9808345	3.04	248.0	95.60	87	0	4.26	0.14	0	3/24/1999	
1999	Foundation	990863-1	9904487	1.76	279.5	90.13	90	0	9.86	0.01	0	1/26/2000	
1999	Foundation	990863-1	9903569	1.28	165.0	93.62	88	0	6.35	0.03	0	1/12/2000	Plateau
2000	Foundation	201150-1	2007607	3.04	294.0	95.89	90	1	3.95	0.16	0	3/13/2001	
2001	Foundation	S0113839	2107325	3.04	419.0	96.95	86	0	2.98	0.07	0	3/27/2002	
2002	Foundation	S0210299	L2210878	3.04	115.0	88.48	30	49	11.51	0.01	0	4/10/2003	
2003	Foundation	C54832	L2304932	3.04	328.0	93.90	28	57	6.1	0	0	2/3/2004	
2004	Foundation	S0412038	L2411492	3.00	446.0	96.61	55	37	3.38	0.01	0	4/15/2005	
2005	Foundation	S0513080	L2509594	3.00	462.0	96.40	47	42	3.6	0	0	3/20/2006	
2006	Foundation	S0611773	L2609510	3.00	26.0	69.03	47	38	30.95	0.01	0.01	3/28/2007	
2007	Foundation	C69301	L2703199	3.0	724.0	97.63	42	46	2.33	0.03	0.01	12/13/2007	

Accession: 'Bonilla' (SD-27, PI-315658)
Name/Species: big bluestem, *Andropogon gerardii*
Location: Field D-10
Year of Establishment: 1987
Origin/Source: Morton County; USDA, ARS, Mandan, North Dakota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
1988	Foundation	1764	M35857	1.40	320.0	97.04	74	1	2.96	0.00	0.00	3/27/1989
1989	Foundation	91992	N10095	1.40	159.0	95.33	76	0	4.66	0.00	0.01	12/15/1989
1990	Foundation	1650	N2322	1.40	115.0	98.07	83	1	1.92	0.00	0.01	1/17/1991
1991	Foundation	2135	N18291	1.40	118.0	93.76	77	0	6.24	0.00	0.00	1/27/1992
1992	Foundation	1053-1	P08550	1.42	175.0	92.16	73	0	7.83	0.00	0.00	1/12/1993
1993	Foundation	3067-1	9303772	1.42	165.0	95.07	72	0	4.93	0.00	0.00	2/28/1994
1994	Foundation	940232-1	9406903	1.42	276.5	93.34	82	1	6.64	0.00	0.02	1/31/1995
1995	Foundation	950194-1	9514495	1.42	124.5	97.35	89	0	2.64	0.01	0.00	4/22/1996
1996	Foundation	960049-1	9609264	1.42	242.0	85.85	78	0	14.14	0.01	0.00	3/18/1997
1997	Foundation	970037-1	9709197	1.42	180.5	92.18	83	1	7.82	0.00	0.00	3/13/1998
1998	Foundation	980059-1	9803403	1.42	298.0	97.22	88	1	2.78	0.00	0.00	1/5/1999
1999	Foundation	990858-1	9910452	1.42	237.5	94.58	87	0	5.42	0.00	0.00	4/27/2000
2000	Foundation	201151-1	2011941	1.42	168.0	89.14	92	0	10.84	0.01	0.01	5/4/2001
2001	Foundation	S0113838	2106047	1.42	49.0	92.78	88	0	6.75	0.46	0.01	2/26/2002
2002	Foundation	S0210303	L2213179	1.42	71.0	95.5	70	16	4.48	0.01	0.01	5/7/2003
2003	Foundation	C5660	L2311320	1.42	200.0	93.26	73	19	6.74	0.00	0.00	4/22/2004
2004	Foundation	S0412037	L2413895	1.40	198.0	94.75	79	14	5.25	0.00	0.00	5/6/2005
2005	Foundation	S0513081	L2513292	1.40	258.0	97.87	72	15	2.13	0.00	0.00	5/4/2006
2006	minimal harvest	S0611774	no test	1.40	0.0							
2007	Foundation	C70557	L2708118	1.4	242.0	97.66	78	8	2.34	0.00	0.00	3/11/2008

Accession: 9082680
Name/Species: fourwing saltbush, *Atriplex canescens*
Location: Field D10df
Year of Establishment:
Origin/Source: Cottonwood, South Dakota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
2002	breeder		no test		5.5		78(TZ)	0	1.4	0.00	0.00	11/13/2002
2003	breeder				3.5	98.6	46	9(hard)	1.4	0.00	0.00	3/3/2004
2004	breeder		no test		6.0							
2005	breeder		no test	100-ft row	0.5							
2006	breeder		no test		20.0							
2007	breeder		bulked with previous years' crop		5.0							

Accession: Pierre (SD-251, PI-476980)
Name/Species: sideoats grama, *Bouteloua curtipendula*
Location: Field E-9
Year of Establishment: 1977
Origin/Source: Stanley County; Ft. Pierre, South Dakota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
1978	Common		H20314	2.40	24.0	89.45	63		10.54		0.01	5/1/1979
1979	Common		I7089	2.40	899.0	88.58	76		11.41	0.01		4/18/1980
1980	Foundation	1020	J7932	1.00	125.0	96.36	69		3.63	0.01		5/11/1981
1981	Foundation	1177	J20193	1.00	346.0	96.74	80		3.24	0.01	0.01	3/25/1982
1982	Foundation	1160	J36814	1.00	344.0	97.43	56		2.55	0.01	0.01	3/24/1983
1983	Foundation	1498	K11299	1.00	520.0	97.85	82	1	2.13	0.01	0.01	4/12/1984
1984	Foundation	1643	K27724	1.00	248.0	98.78	88		1.20	0.01	0.01	4/15/1985
1985					No harvest							
1986	Common		L22863	1.00	123.0	98.77	87	1	1.23	0.00	0.00	3/24/1987
1987	Foundation	16797	M16481	1.00	192.0	93.11	64	1	6.89	0.00	0.00	4/20/1988
1988	Foundation	1777	M29887	1.00	218.0	97.8	77	1	2.18	0.02	0.00	1/3/1989
1989	Foundation	92011	N11668	0.90	129.0	99.34	61	0	0.66	0.00	0.00	1/17/1990
1990	Foundation	1666	N8366	1.10	572.0	98.06	92	0	1.93	0.01	0.00	4/16/1991
1991	Foundation	2143	N20087	1.10	273.5	97.85	80	0	2.13	0.02	0.00	2/28/1992
1992	Foundation	1049-1	P09603	1.10	229.0	93.28	83	0	6.70	0.00	0.02	2/4/1993
1993	Foundation	3062-1	9308492	1.10	113.0	94.19	71	0	5.81	0.00	0.00	4/27/1994
1994	Foundation	940238-1	9411461	1.09	100.0	96.57	68	0	3.43	0.00	0.00	3/21/1995
1995	Foundation	950191-1	9508544	1.09	234.5	97.69	75	0	2.29	0.02	0.00	2/21/1996
1996	Foundation	960044-1	9607307	1.09	186.0	98.43	81	0	1.57	0.00	0.00	2/20/1997
1997	Foundation	970044-1	9711274	1.09	92.5	90.16	88	0	9.84	0.00	0.00	3/19/1998
1998	Foundation	980056-1	9809152	1.09	174.5	96.45	85	0	3.55	0.00	0.00	3/30/1999
1999	Foundation	990860-1	990860-1	1.09	218.5	93.00	81	4	6.96	0.02	0.02	12/14/1999
2000	Foundation	201154-1	2002097	1.09	282.5	98.13	61	24	1.72	0.13	0.02	11/22/2000
2001	Foundation	S0113834	2103684	1.09	288.0	98.30	77	6	1.65	0.00	0.05	12/27/2001
2002	Foundation	S0210298	L2208214	1.09	200.0	95.51	82	0	4.47	0.02	0.00	2/28/2003
2003	Foundation	C56260	L2310165	1.09	157.0	93.95	75	11	6.03	0.02	0.00	4/7/2004
2004	Foundation	S0412041	L2410470	1.10	159.0	98.79	91	0	1.11	0.08	0.02	3/30/2005

Accession: Pierre (SD-251, PI-476980) (continued)
Name/Species: sideoats grama, *Bouteloua curtipendula*
Location: Field E-9
Year of Establishment: 1977
Origin/Source: Stanley County; Ft. Pierre, South Dakota

Prod.		App./Cert.	Seed		Bulk (lbs)						Other	Test
Year	Seed Class	No.	Lab No.	Acres	Quantity	Purity	Germ.	Dorm.	Inert	Weed	Crop	Date
2005	Foundation	S0513077	L2507111	1.10	170.0	98.95	87	1	1.03	0.02	0.00	2/14/2006
2006	Foundation	S0611782	L2602844	1.10	115.0	96.82	30	37	3.16	0.02	0.00	12/4/2006
2007	Foundarion	C69026	L2702396	1.10	236.0	96.13	35	60	3.83	0.02	0.02	11/21/2007

Accession: Pierre (SD-251, PI-476980)
Name/Species: sideoats grama, *Bouteloua curtipendula*
Location: Minot Experiment Station
Year of Establishment: 2004
Origin/Source: Stanley County; Ft. Pierre, South Dakota

Prod.		App./Cert.	Seed		Bulk (lbs)						Other	Test
Year	Seed Class	No.	Lab No.	Acres	Quantity	Purity	Germ.	Dorm.	Inert	Weed	Crop	Date
2004	establishment	S0412378		3.00	0.0							
2005	failed*	S0513917	L2508235	3.00	300.0	97.69	71	20	2.15	0.16	0.00	2/27/2006
2006	common		no test		20.0							
2007	Failed			3.00	307.0							

*seed lot failed to meet certification and was prohibited from sale in North Dakota due to excess of 25 seeds/lb of wild oats

Accession: Bad River ecotype (9063064)
Name/Species: blue grama, *Bouteloua gracilis*
Location: Field D-11
Year of Establishment: 1992
Origin/Source: Haakon County; Philip, South Dakota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
1993	Common		9311846	1.4	13.0	90.14	54	0	9.86	0.00	0.00	5/19/1994
1994	Common		9414480	1.4	26.5	96.25	83	0	3.70	0.00	0.05	5/11/1995
1995	Select (G2)	950187-1	9510001	1.4	229.0	93.88	92	1	6.02	0.05	0.05	3/13/1996
1996	Select (G2)	960038-1	9606989	1.4	63.0	84.86	88	0	15.04	0.05	0.05	2/21/1997
1997	Select (G2)	970035-1	9707327	1.4	175.5	95.75	96	0	4.15	0.05	0.05	3/2/1998
1998	Select (G2)	980060-2	9805427	1.4	189.5	94.62	98	0	5.28	0.05	0.05	3/12/1999
1999	Select (G2)	990866-2	990866-2	1.4	57.0	91.14	97	0	8.86	0.00	0.00	4/28/2000
2000	Select (G2)	201162-1	2006091	1.4	221.0	95.71	95	0	4.20	0.05	0.05	2/14/2001
2001	Select (G2)	S0113835	2105431	1.4	206.0	97.29	80	4	2.71	0.00	0.00	1/24/2002
2002	Select (G2)	S0210300	L2207748	1.4	98.0	94.76	98	0	4.85	0.34	0.05	2/18/2003
2003	Select (G2)	C56404	L2310635	3.34*	66.0	89.72	94	0	10.23	0.05	0.00	4/14/2004
2004	Select (G2)	S0412030 S0412031	L2408531	3.34*	200.0	98.26	98	0	1.64	0.10	0.00	3/10/2005
2005	Select (G2)	S0513079	L2507760	1.4	31.0	93.58	93	0	6.32	0.10	0.00	2/22/2006
2006	no harvest	S0611776		1.4	0.0							
2007	Select (G2)	C69982	L2705622	1.4	25.0	87.69	89	0	12.10	0.17	0.04	2/4/2008

*combined fields D-8 and D-11

Accession: Bad River ecotype (9063064)
Name/Species: blue grama, *Bouteloua gracilis*
Location: Field D-8
Year of Establishment: 1995
Origin/Source: Haakon County; Philip, South Dakota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
1997	Select (G2)	970035-2	9707324	1.94	172.5	94.7	98	0	5.05	0.20	0.05	3/2/1998
1998	Select (G2)	980060-1	9805428	1.94	113.5	95.05	96	0	4.85	0.00	0.00	3/4/1999
1999	Select (G2)	990866-1	9912265	1.94	80.5	90.99	96	0	8.60	0.37	0.04	4/18/2000
2000	Select (G2)	201162-2	2006356	1.94	162.0	96.12	97	0	3.83	0.05	0.00	2/14/2001
2001	Select (G2)	S0113836	2105135	1.94	243.0	92.04	86	0	7.79	0.17	0.00	1/23/2002
2002	Select (G2)	S0210301	L2207397	1.94	112.0	95.12	98	0	4.69	0.14	0.05	2/18/2003
2003	Select (G2)	C56404	L2310635	3.34*	66.0	89.72	94	0	10.23	0.05	0.00	4/14/2004
2004	Select (G2)	S0412030 & S0412031	L2408531	3.34*	200.0	98.26	98	0	1.64	0.10	0.00	3/10/2005
2005	Select (G2)	S0513078	L2508234	1.90	37.0	84.27	93	0	14.89	0.84	0.00	2/27/2006
2006	no harvest	S0611781										
2007	Select (G2)	C70070	L2706148	1.9	19	89.16	92	0	9.72	1.08	0.04	2/13/2008

*combined fields D-8 and D-11

Accession: Bismarck germplasm (9006032)
Name/Species: purple prairieclover, *Dalea purpurea*
Location: Field D-11
Year of Establishment: 2002
Origin/Source: South Dakota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
2004	Select (G1)	S0412052	L2406447	0.6	270.00	99.16	22	0	0.82	0.02	0.00	2/8/2005
2005	Select (G1)	S0513083	L2502175	0.6	61.00	98.11	30	58(hard)	1.86	0.03	0.00	11/29/2005
2006	Select (G1)	S0611784	L2604046	0.6	31.00	98.09	26	55(hard)	1.73	0.18	0.00	12/26/2006
2007	Failed			0.6	30.00							

Accession: Medicine Creek germplasm (ND-3651, 9008065)
Name/Species: Maximilian sunflower, *Helianthus maximiliani*
Location: Field D-11
Year of Establishment: 1983/1985
Origin/Source: Hughes County, South Dakota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
1983	Common		K11447	0.05	3.5	97.03	18		2.90	0.00	0.07	4/27/1984
1984	Common		K31783	0.05	6.0	91.85	23		4.76	3.39	0.00	5/31/1985
1985	Common		L9742	0.63	15.0	79.29	41		20.51	0.71	0.03	4/21/1986
1986	Common		L28597	0.63	8.0	78.05	20		18.21	3.68	0.06	4/2/1987
1987	Common		M20825	0.63	13.0	71.82	6		27.99	0.15	0.04	5/20/1988
1988	Common		N17895	0.70	1.3	99.46	11		0.54	0.00	0.00	4/3/1990
1989	Common		N20601	0.70	4.5	62.66	5		37.24	0.06	0.04	5/4/1990
1990					0.0							
1991	Common		P03393 P03590	0.70	86.5	92.12	65 (TZ)		7.02	0.86		7/29/1992
1992	Common		P17831	0.70	31.0	88.38	1	47	11.03	0.59	0.00	5/11/1993
1993	Common		9312790	0.70	40.5	83.14	1	18	16.57	0.29	0.00	6/13/1994
1994	Common		9402979	0.70	70.5	84.69	0	63	13.92	1.39	0.00	11/14/1994
1995	Common		9513275	0.70	31.0	93.57	18	67	5.18	1.25	0.00	3/25/1996
1996	Common		9604738	0.70	35.5	83.66	15	48	16.05	0.29	0.00	12/19/1996
1997	Common		9709183	0.70	64.0	83.20	4	70	16.75	0.05	0.00	3/2/1998
1998	Common		9811399	0.70	96.5	94.27	30	64	5.26	0.47	0.00	4/13/1999
1999	Select (G1)	990870-1	9909471	0.70	26.0	98.45	18	39	0.68	0.86	0.01	3/20/2000
2000	Select (G1)	201147-1	2005815	0.70	20.0	98.08	25	60	1.47	0.46	0.00	2/5/2001
2001	Select (G1)	S0113843	2105127	0.70	15.5	98.10	58	27	0.94	0.96	0.00	1/23/2002
2002	Select (G1)	S0210293	L2203526	0.70	40.0	95.71	12	79	4.15	0.13	0.01	12/20/2002
2003	Select (G1)	C56405	L2310636	0.70	60.0	99.02	33	56	0.34	0.58	0.06	4/16/2004
2004	Select (G1)	S0412050	L2410471	0.70	27.0	91.55	43	54	4.04	4.39	0.02	3/28/2005
2005	Select (G1)	S0513084	L2503953	0.70	57.0	98.17	6	74	1.12	0.71	0.00	12/27/2006
2006	Select (G1)	C66808	L2607438	0.70	18.0	91.38	35	38	8.45	0.05	0.12	2/21/2007
2007	Select (G1)	C71064	L2710351	0.70	48.0	96.26	5	73	3.72	0.02	0.00	4/8/2008

Accession: 'Lodorm'
Name/Species: green needlegrass, *Nassella viridula*
Location: Minot Experiment Station
Year of Establishment: 2000
Origin/Source:

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
2000	Foundation	201568-1	2001852	5.00	695.5	99.37	18	64	0.63	0.00	0.00	11/15/2000
2001	Foundation	S0113585	L2102692	5.00	885.0	90.34	9	89	9.58	0.07	0.01	12/7/2001
2002	Foundation	S0210285	L2202494	5.00	650.0	99.86	16	82	0.14	0.00	0.00	11/29/2002
2003	Foundation	C54599	L2303876	5.00	667.0	99.65	7	90	0.35	0.00	0.00	12/29/2003
2004	Foundation	X0412377	L2412470	5.00	196.5	99.97	33	54	0.03	0.00	0.00	4/26/2005
2005	Foundation	S0513916	L2506373	5.00	341.5	99.93	17	67	0.04	0.03	0.00	2/7/2006
2006	Foundation	C65837	L2604045	5.00	425.0	99.99	32	66	0.01	0.00	0.00	12/26/2006
2007	Foundation	C70250	L2706830	5.00	450.0(lot A)	99.80	14	84	0.19	0.01	0.00	2/21/2008
2007	Foundation	C70251	L2706831	5.00	115.0(lot B)	99.99	20	72	0.01	0.00	0.00	2/21/2008

Accession: 'Dacotah' (NDG-965-98, PI-478002)
Name/Species: switchgrass, *Panicum virgatum*
Location: Minot
Year of Establishment: 1999
Origin/Source: Burleigh County; Bismarck, North Dakota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
2000	Common	Failed	2003699	2.00	300.0	96.28	87	9	0.03	3.69	0.00	1/10/2001
2001	Common	Failed	2109464	2.00	635.0	99.13	88	4	0.2	0.67	0.00	4/22/2002
2002	Certified	S0210284	L2214326	2.00	462.0	98.85	75	16	0.44	0.71	0.00	5/9/2003
2003	Foundation	C56850	L2312108	2.00	250.0	99.54	67	19	0.44	0.02	0.00	0/13/2004
2004	No harvest	S0412379										
2005	Foundation	S0513918	L2511313	3.00	1719.0	99.75	88	4	0.1	0.15	0.00	4/20/2006
2006*	Foundation	C66831	L2607547	3.00	17.0	99.44	82	7	0.44	0.10	0.02	3/7/2006
2007	Foundation	C71414	L2712069	3.00	1250.0	99.76	77	16	0.22	0.02	0.00	5/8/2008

* This is only a portion of the harvest. Remainder of harvest did not meet foundation standards.

Accession: 'Forestburg' (SD-149, PI-478001)
Name/Species: switchgrass, *Panicum virgatum*
Location: Field D-11
Year of Establishment: 1999
Origin/Source: Sanborn County; Forestburg, South Dakota; composite of SD-62, 205, 206, 203

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
2000	Foundation	201163-1	2010929	1.2	776	99.96	77	3	0.02	0.02	0.00	4/18/2001
2001	Foundation	S0113837	2111414	1.2	840	99.95	82	0	0.05	0.00	0.00	4/22/2002
2002	Foundation	S0210302	L2205339	1.2	144	99.82	49	29	0.16	0.02	0.00	1/31/2003
2003	Foundation	C56259	L2310164	1.2	157	99.16	88	7	0.72	0.07	0.05	4/22/2004
2004	Foundation	S0412032	L2415348 L2506244	1.2	476.5	99.47	68	2	0.51	0.02	0.00	5/19/2005
2005	Foundation	S0513082	L2515485	1.2	591	98.89	70	0	1.09	0.02	0.00	7/10/2006
2006	Foundation	C67586	L2610436	1.2	200	99.87	87	5	0.11	0.02	0.00	4/20/2007
2007	Foundation	C69781	L2704963	1.2	644	99.90	73	11	0.10	0.00	0.00	2/5/2008

Accession: 'Mankota' (Mandan-1808, PI-556988)
Name/Species: Russian wildrye, *Psathyrostachys juncea*
Location: Field E-7
Year of Establishment: 1989
Origin/Source: USDA-ARS, Mandan, North Dakota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
1990	Foundation	1672	N12762	0.90	61.0	97.01	81	0	2.99	0.00	0.00	6/27/1991
1991	Foundation	2140	N16912	0.90	87.5	98.88	92	0	1.11	0.00	0.01	12/17/1991
1992	Foundation	1048-1	P09590	0.90	346.0	98.29	89	0	1.71	0.00	0.00	1/27/1993
1993	No Harvest	Hail Damage										
1994	Foundation	940240-1	9415075	0.90	85.0	98.19	86	0	1.81	0.00	0.00	5/11/1995
1995	Foundation	950190-1	9513273	0.90	162.0	96.27	89	0	3.68	0.00	0.05	3/28/1996
1996	Foundation	960043-1	9606064	0.90	192.0	98.94	93	0	1.06	0.00	0.00	1/16/1997
1997	Foundation	970041-1	9707326	0.90	286.5	99.57	94	0	0.43	0.00	0.00	3/2/1998
1998	Foundation	980062-1	9905046	0.90	248.0	98.13	91	0	1.87	0.00	0.00	1/31/2000
1999	Foundation	990862-1	9905685	1.05	273.0	97.69	90	0	2.31	0.00	0.00	2/10/2000
2000	Common	Failed	2001552	1.05	154.0	98.37	74	0	1.63	0.00	0.00	11/15/2000
2001	No Harvest	Hail										
2002	Foundation	S0210290	L2210006	1.05	89.0	99.50	97	0	0.48	0.00	0.02	3/31/2003
2003	Foundation	C56740	L2311863	1.05	178.0	97.71	89	0	2.29	0.00	0.00	5/6/2004
2004	Foundation	S0412045	L2404350	1.10	65.0	99.52	94	XXX	0.48	0.00	0.00	1/12/2005
2005	Foundation	S0513070	L2506243	1.10	50.0	99.67	93	XXX	0.31	0.02	0.00	2/10/2006
2006	Foundation	C66130	L2605071	1.10	100.0	99.38	92	XXX	0.62	0.00	0.00	1/25/2007
2007	Foundation	C70180	L2706530	1.10	184.0	99.60	96	XXX	0.4	0.00	0.00	2/14/2008

Accession: 'Badlands' ecotype (ND-4115, 9036131)
Name/Species: little bluestem, *Schizachyrium scoparium*
Location: Field E-13 (adjacent to breeder's block)
Year of Establishment: 1989
Origin/Source: western North Dakota and western and central South Dakota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
1990	Common		N8367	0.90	28.0	87.89	79	0	12.11	0.00	0.00	4/16/1991
1991	Common		P03212	0.90	78.5	64.08	59	0	35.92	0.00	0.00	5/28/1992
1992	Common		P16680	1.04	199.5	95.86	87	0	4.14	0.00	0.00	5/6/1993
1993	Common		9307613	1.04	83.0	93.94	78	0	6.06	0.00	0.00	4/13/1994
1994	Select (G2)	no tags	9415448	1.04	81.5	95.82	81	0	4.18	0.00	0.00	5/8/1995
1995	Select (G2)	9508543	9508543	1.04	60.0	87.14	67	0	12.84	0.02	0.00	2/21/1996
1996	Select (G2)	960047-1	9606987	2.17	113.0	86.11	75	0	13.85	0.02	0.02	2/18/1997
1997	Select (G2)	970040-1	9705283	2.17	221.5	93.87	80	0	6.13	0.00	0.00	1/23/1998
1998	Select (G2)	980064-1	9810818	2.17	53.0	66.21	72	0	33.75	0.02	0.02	4/19/1999
1999	Select (G2)	990861-1	9911692	2.17	210.0	74.00	70	0	25.98	0.00	0.02	5/1/2000
2000	Select (G2)	201157-1	2002928	2.17**	108.5	89.69	84	1	10.31	0.00	0.00	12/27/2000
2000	Select (G2)	201157-1	2003249	12 rows	52.0	93.70	84	0	6.26	0.02	0.02	1/3/2001
2001	Select (G2)	S0113840	2111940	2.17	247.0	92.6	88	0	7.38	0.02	0.00	5/2/2002
2002	Select (G2)	S0210304	L2209496	2.17	334.0	92.45	75	2	7.55	0.00	0.00	3/25/2003
2003	Select (G2)	C55305	L2306970	2.17	365.0	95.94	84	3	4.06	0.00	0.00	2/23/2004
2004	Select (G2)	S0412039	L2406861	2.20	89.0	95.98	71	16	3.85	0.15	0.02	2/22/2005
2004	Select (G2)	S0412039	L2406860	2.20	224.0	96.83	67	16	3.17	0.00	0.00	2/15/2005
2005	Select (G2)	S0513073	L2505889	2.20	390.0	93.79	79	7	6.19	0.02	0.00	1/31/2006
2006	Select (G2)	C66297	L2605801	2.20	241.0	94.17	65	24	5.81	0.00	0.02	1/25/2007
2007	Select (G2)	C71147	L2710754	2.20	227.0	92.66	66	20	7.19	0.13	0.02	4/14/2008

*1992 and 1993 harvest is a composite of field and 340 plant breeder's block

**This acreage amount includes the 12 rows sprayed with plateau

Accession: 'Itasca' germplasm (9063125)
Name/Species: little bluestem, *Schizachyrium scoparium*
Location: Minot Experiment Station
Year of Establishment: 2001
Origin/Source:

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
2002	No seed production											
2003	Select (G2)	C55803	L2308592	4.00	26.0	79.48	42	36	20.04	0.02	0.46	3/19/2004
2004	No harvest	S0412381		3.00								
2005	Select (G2)	S0513915	L2503952	3.00	28.0	97.35	51	27	2.57	0.02	0.06	1/3/2006
2006	Select (G2)			3.00	20.0	no test						
2007	Select (G2)	C71414	L2704724	3.00	172.0	82.34	47	40	17.59	0.05	0.02	1/22/2008

Accession: 'Tomahawk' (ND-444, PI-478006)
Name/Species: Indiangrass, *Sorghastrum nutans*
Location: Field E-10
Year of Establishment: 1980/1987
Origin/Source: Dickey County, North Dakota, and Marshall and Brown Counties, South Dakota; composite of ND-343, SD-44, and SD-56

Prod.		App./Cert.	Seed		Bulk (lbs)						Other	
Year	Seed Class	No.	Lab No.	Acres	Quantity	Purity	Germ.	Dorm.	Inert	Weed	Crop	Test Date
1981	Common		J22004	2.1	105.0	98.42	52	2	1.21	0.37		4/6/1982
1982	Common		J36789	2.1	371.0	97.78	87		0.13	2.09		3/23/1983
1983	Common		K14524	2.1	350.0	94.70	78	2	5.23	0.07		4/24/1984
1984	Common		K27728	2.1	535.0	98.19	78	8	1.67	0.07	0.07	4/8/1985
1985	Common	(gr.1)	L5477	2.1	158.0	98.97	92	1	0.96		0.07	3/4/1986
		(gr.2)	L9740		39.0	66.27	85		33.56		0.17	4/30/1986
1986	Common		L24835	2.1	306.0	93.25	67	12	6.74	0.01	0.00	4/14/1987
1987	Foundation		M20157	2.1	55.0	97.84	83	2	2.06	0.00	0.10	5/31/1988
1988	Foundation	1779	N0859	2.5	285.0	97.50	91	0	2.54	0.00	0.00	4/14/1989
1989	Foundation	92016	N13244	2.5	570.0	99.92	93	0	0.07	0.00	0.01	2/13/1990
1990	Foundation	1670	N3775	2.5	392.0	99.05	94	0	0.94	0.00	0.01	2/12/1991
1991		2145	N24194	2.5	243.5	99.98	93	1	0.01	0.00	0.01	4/16/1992
1992	Foundation	1050-1	P15260	2.5	242.0	98.96	84	1	1.02	0.01	0.01	4/26/1993
1993	Foundation	3065-1	9312026	2.5	240.5	98.06	76	2	1.88	0.03	0.03	5/25/1994
1994	Foundation	940237-1	9416108	2.5	226.6	98.29	92	1	1.69	0.02	0.00	5/25/1995
1995	Foundation	950185-1	9510002	0.55	86.5	97.54	87	2	2.46	0.00	0.00	3/12/1996
1996	Foundation	960045-1	9609262	0.55	153.5	97.80	87	2	2.19	0.01	0.00	3/18/1997
1997	Foundation	970042-1	9706071	0.55	146.5	93.77	82	2	6.23	0.00	0.00	1/29/1998
1998	Foundation	980063-1	9803880	0.55	100.0	95.15	59	26	4.85	0.00	0.00	1/12/1999
1999	Foundation	990857-1	9901982	0.55	107.0	97.34	95	2	2.64	0.01	0.01	12/14/1999
2000	Foundation	201155-1	2002466	2.5	242.5	95.41	86	8	4.57	0.01	0.01	12/18/2000
2001	Foundation	S0113833	2104452	2.5	324.0	97.24	68	10	2.74	0.01	0.01	1/16/2002
2002	Foundation	S0210306	L2206466	2.5	157.0	88.09	5	58	11.67	0.23	0.01	1/31/2003
2003	Foundation	C54496	L2303272	2.5	609.0	98.26	3	86	1.74	0.00	0.00	12/17/2003
2004	Foundation	S0412040	L2403177	2.5	645.0	98.80	8	76	1.20	0.00	0.00	12/28/2004
2005	Foundation	S0513076	L2502365	2.5	693.0	99.13	6	80	0.86	0.01	0.00	12/5/2005
2006	Foundation	C65713	L2603399	2.5	250.0	97.92	3	91	2.08	0.00	0.00	12/14/2006

Accession: 'Tomahawk' (ND-444, PI-478006) continued
Name/Species: Indiangrass, *Sorghastrum nutans*
Location: Field E-10
Year of Establishment: 1980/1987
Origin/Source: Dickey County, North Dakota, and Marshall and Brown Counties, South Dakota; composite of ND-343, SD-44, and SD-56

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
2007	Not cleaned yet	S0710030		2.5								

Accession: 'Red River' germplasm (9069159)
Name/Species: prairie cordgrass, *Spartina pectinata*
Location: Field D-11
Year of Establishment: 2004
Origin/Source: North Dakota, South Dakota, and Minnesota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
2004	Select (G1)	S0412033		1.0	no harvest							
2005	Select (G1)	S0513075 S0513074		2.5	318.0	93.98	35	45	5.44	0.42	0.16	3/23/2006
2006	no harvest											
2007	Select (G1)	C70775	L2709075	2.5	87.0	77.13	14	72	22.85	0.01	0.01	4/1/2008

Accession: 'Red River' germplasm (9069159)
Name/Species: prairie cordgrass, *Spartina pectinata*
Location: Field E-9
Year of Establishment: 2003
Origin/Source: North Dakota, South Dakota, and Minnesota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
2004		S0412035		1.50	0.0							
2005	combined with field D-11											
2006	No harvest											
2007	Bulked with field D-11											

Accession: 'Reliant' (Mandan-1813, PI-556987)
Name/Species: intermediate wheatgrass, *Thinopyrum intermedia*
Location: Field D-7
Year of Establishment: 1989
Origin/Source: USDA, ARS, Mandan, North Dakota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
1990	Foundation	1673	N12763	0.92	397.00	99.39	94		0.61	0.00	0.00	6/27/1991
1991	Foundation	2144	N16914	0.92	171.50	98.33	90		1.65	0.01	0.01	12/17/1991
1992	Foundation	1044-1	P09589	0.92	157.00	98.23	90		1.77	0.00	0.00	2/2/1993
1993				0.92	No harvest							
1994	Foundation	940234-1	9407584	0.92	96.50	97.33	98		2.67	0.00	0.00	2/6/1995
1995	Foundation	950192-1	9510849	0.92	286.50	97.39	85	0	2.59	0.01	0.01	3/12/1996
1996	Foundation	960048-1	9606991	0.92	218.50	93.51	92	0	6.49	0.00	0.00	2/13/1997
1997	Foundation	970039-1	9705284	0.92	383.00	98.73	98	0	1.27	0.00	0.00	1/14/1998
1998	Foundation	981858-1	9806829	0.92	360.00	98.09	97	0	1.91	0.00	0.00	2/26/1999
1999	Foundation	990856-1	9906202	0.92	260.00	96.55	96	0	3.44	0.00	0.01	2/22/2000
2000	Foundation	201146-1	2006168	0.92	150.00	96.09	93	0	3.89	0.02	0.00	2/20/2001
2001	Hail				No harvest							
2002	Foundation	S0210288	L2208213	0.92	123.00	98.33	96	0	1.66	0.01	0.00	3/3/2003
2003	Foundation	C56315	L2310270	0.92	223.00	97.74	88	0	2.24	0.01	0.01	4/22/2004
2004	Foundation	C59967	L2409682	0.9	181.00	97.34	94	XXX	2.63	0.00	0.03	4/4/2005
2005	Foundation	C61875	L2502733	0.9	150.00	96.04	91	XXX	3.95	0.01	0.00	12/21/2005
2006	Foundation	C66479	L2606470	0.9	66.00	99.23	95	XXX	0.77	0.00	0.00	2/13/2007
2007	Foundation	C69782	L2704964	0.9	274.00	99.45	95	0	0.53	0.01	0.01	1/30/2008

Accession: 'Manska' (Mandan-2781, PI-562527)
Name/Species: pubescent wheatgrass, *Thinopyrum intermedia*
Location: Field E-6
Year of Establishment: 1990
Origin/Source: USDA, ARS, Mandan, North Dakota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
1991	Foundation	2142	N16913	1.29	667.5	98.04	93	0	1.95	0.01	0.00	3/4/1992
1992	Foundation	1047-1	P05952	1.29	405.0	94.49	85		5.51	0.00	0.00	11/30/1992
1993				1.29	no harvest (hail damage)							
1994	Foundation	940229-2	9404404	1.29	47.0	91.19	91	0	8.78	0.01	0.02	12/20/1994
1995	Foundation	950184-2	9506968	1.29	337.5	98.05	85	0	1.93	0.01	0.01	1/26/1996
1996	Foundation	960040-2	9606988	1.29	311.0	95.16	88	0	4.83	0.01	0.00	2/13/1997
1997	Foundation	970034-1	9706070	1.29	606.5	98.22	97	0	1.78	0.00	0.00	1/27/1997
1998	Foundation	980065-2	9804229	1.29	386.0	98.71	95	0	1.28	0.01	0.00	1/21/1999
1999	Foundation	990865-1	9902645	1.29	519.5	96.99	98	0	3.00	0.01	0.00	12/20/1999
2000	Foundation	201152-1	2008385	1.29	356.0	97.43	93	0	2.57	0.00	0.00	3/14/2001
2001	Hail				no harvest							
2002	Foundation	S0210291	L2214325	1.29	214.0	98.30	96	0	1.70	0.00	0.00	5/23/2003
2003	Foundation	C55869	L2308857	1.29	396.0	97.33	90	0	2.66	0.01	0.00	4/5/2004
2004	Foundation	S0412043	L2404349	1.3	504	97.5	96	XXX	2.50	0.00	0.00	1/24/2005
2005	Foundation	S0513068	L2502732	1.3	183	97.85	96	XXX	2.13	0.01	0.01	12/20/2005
2006	Foundation	C66558	L2606803	1.3	173	99.14	93	XXX	0.85	0.01	0.00	2/20/2007
2007	Foundation	C69509	L2703909	1.3	530	97.87	97	XXX	2.13	0.00	0.00	1/15/2008

Accession: 'Manska' (Mandan-2781, PI-562527)
Name/Species: pubescent wheatgrass, *Thinopyrum intermedia*
Location: Field D-11
Year of Establishment: 1993
Origin/Source: USDA, ARS, Mandan, North Dakota

Prod. Year	Seed Class	App./Cert. No.	Seed Lab No.	Acres	Bulk (lbs) Quantity	Purity	Germ.	Dorm.	Inert	Weed	Other Crop	Test Date
1994	Foundation	940229-1	9404403	1	351.0	96.46	96	0	3.53	0.01	0.00	12/20/1994
1995	Foundation	950184-1	9506967	1	230.0	96.62	82	0	3.37	0.01	0.00	2/5/1995
1996	Foundation	960040-1	9606990	1	181.0	98.69	92	0	1.31	0	0.00	2/13/1997
1997	Foundation	970034-2	9707325	1	317.5	97.59	97	0	2.41	0	0.00	3/2/1998
1998	Foundation	980065-1	9804481	1	255.0	98.19	96	0	1.79	0.01	0.01	1/28/1999
1999	Foundation	990865-2	9902843	1	340.5	97.86	97	0	2.14	0.00	0.00	12/22/1999
2000	Foundation	201152-2	2009285	1	300.0	97.13	85	0	2.86	0.00	0.01	4/2/2001
2001	Hail				No harvest							
2002	Foundation	S0210286	L2211309	1	144.0	97.37	96	0	2.60	0.00	0.03	4/16/2003
2003	Foundation	C55911	L2308981	1	250.0	98.39	83	0	1.61	0.00	0.00	4/6/2004
2004	Foundation	S0412042	L2404351	1	271.0	96.79	94	XXX	3.21	0.00	0.00	1/24/2005
2005	Foundation	S0513067	L2502731	1	93.0	97.97	97	XXX	2.02	0.01	0.00	12/20/2005
2006	Foundation	C66480	L2606472	1	236.0	98.50	90	XXX	1.50	0.00	0.00	2/21/2007
2007	Foundation	C69398	L2703496	1	253	97.42	96	XXX	2.58	0.00	0.00	12/31/2007

STAFFING

STAFFING: TECHNICAL REPORT 2007

PERMANENT POSITIONS
Wayne L. Duckwitz, Manager
Michael J. Knudson, Forester
Nancy K. Jensen, Agronomist
Earl G. Aune, Biological Science Technician
Michael D. Bellon, Biological Science Technician
Rachel H. Bergsagel, Biological Science Technician
Leslie A. Glass, Secretary

STUDENT TRAINEES
Benjamin J. Allen, STEP (2007)

2007 SEASONAL POSITIONS:
Sasha Bergsagel, Seasonal Biological Science Aid
Michael A. Czeczok, WAE, Biological Science Aid
Dennis R. DeVault, WAE, Biological Science Aid
Chandra Heglund, Seasonal Biological Science Aid
Benjamin Keller, Seasonal Biological Science Aid

INFORMATION

INFORMATION: TECHNICAL REPORT 2007

Publications

Fiscal Year 2007

Tober, Dwight, and Rachel Bergsagel 2007. 2006 Report, Off-Center Evaluation Planting of Woody Plant Materials, Becker, Minnesota.. USDA, NRCS, Bismarck, ND. April 2007. 4p.

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