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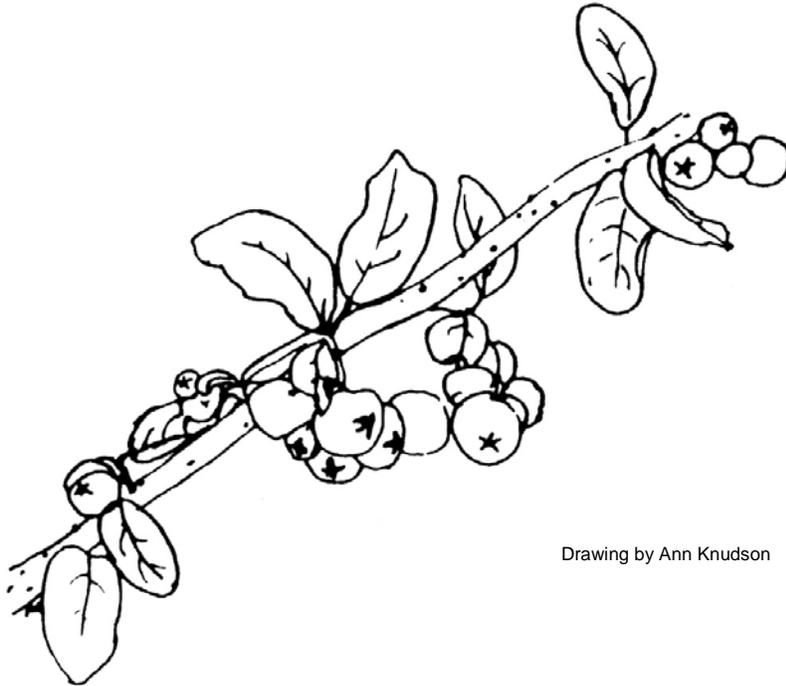
Natural Resources Conservation Service

Plant Materials Center

Bismarck, North Dakota

Technical Report, 2010

Part 2 of 2: Trees and Shrubs



Drawing by Ann Knudson

European cotoneaster
Cotoneaster integerrimus

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

Technical Report
Part II (Trees and Shrubs)
2010

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PART II

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INTRODUCTION

INTRODUCTION: TECHNICAL REPORT – 2010

Objectives and Functions

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

The objectives and functions of the Plant Materials Center are to:

1. Identify, select, and improve plants to meet the resource conservation needs of the three States.
2. Determine techniques for successful propagation and establishment of these plants.
3. Assemble and comparatively evaluate materials on and off the Center.
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. This seed is made available to conservation districts, state seed certifying organizations, commercial seed growers, or other agencies for establishing seed increase fields or seed orchards.
7. Encourage conservation districts, commercial seed growers, and commercial and State nurseries to produce adapted plant materials and named cultivars.
8. Promote improved conservation plant materials in conservation programs.

One of the major objectives of the PMC is to improve the quality and quantity of native and introduced trees and shrubs available for field and farmstead windbreaks, erosion control on cropland and critical areas, recreation areas, wildlife habitat, and barrier plantings.

The NRCS has agreements with soil conservation districts, State universities, and other State, Federal, and local agencies at six locations in Minnesota, North Dakota, and South Dakota to provide cooperative off-center sites with long-term land tenure for testing woody plant materials. These agreements provide sites for assembly and initial evaluation of trees and shrubs under diverse soil and climatic conditions. They represent major land resource areas and key windbreak suitability groups. Initial evaluations are recorded on individual spaced plants or rows under uniform culture and management conditions.

**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 brome grass 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.

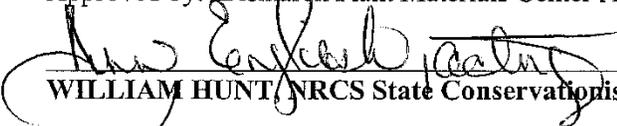
Urban Conservation

- 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 60 acres on Lincoln-Oakes Nursery. Five off-center evaluation sites are located in Minnesota, South Dakota, and North Dakota.

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 60 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. Off-center evaluation sites in Minnesota, South Dakota and North Dakota. These 5 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 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.

Normal precipitation is 16.84 inches per year. Refer to Table 1 on page 7 for 2010 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 1: 2010 Weather Summary - Official Station - Bismarck, North Dakota					
	Mean Temperature		Precipitation (inches)		
	(degrees Fahrenheit)		Actual		Deviation from Normal
Month	2010	Normal*	2010	Normal*	2010
January	9.3	10.2	0.70	0.45	0.25
February	10.5	18.1	0.63	0.51	0.12
March	33.7	29.7	1.06	0.85	0.21
April	47.8	43.3	3.08	1.46	1.62
May	54.2	56.0	3.05	2.22	0.83
June	65.3	64.7	2.48	2.59	-0.11
July	70.7	70.4	3.01	2.58	0.43
August	71.1	69.0	2.74	2.15	0.59
September	56.2	57.7	3.60	1.61	1.99
October	48.7	45.2	0.68	1.28	-0.60
November	28.4	28.0	0.75	0.70	0.05
December	11.6	15.2	1.40	0.44	0.96
Annual	42.3	42.3	23.18	16.84	6.34
* National Climate Data Center 1971-2000 Monthly Normals					
		2010			
	Last Frost (28 degrees)	8-May			
	First Frost (28 degrees)	2-Oct			
	Frost Free Period	146 days			

REGIONAL DESCRIPTION

REGIONAL DESCRIPTION: TECHNICAL REPORT – 2010

Major Land Resource Areas

The three States served by the PMC, Minnesota, North Dakota, and South Dakota, 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. Green ash (*Fraxinus pennsylvanica*) is found in all three states. In the western Dakotas it comprises up to 70 percent of the tall trees in forests. The presence of emerald ash borer (*Agrilus planipennis*) in Minnesota puts the ash resource at risk.

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

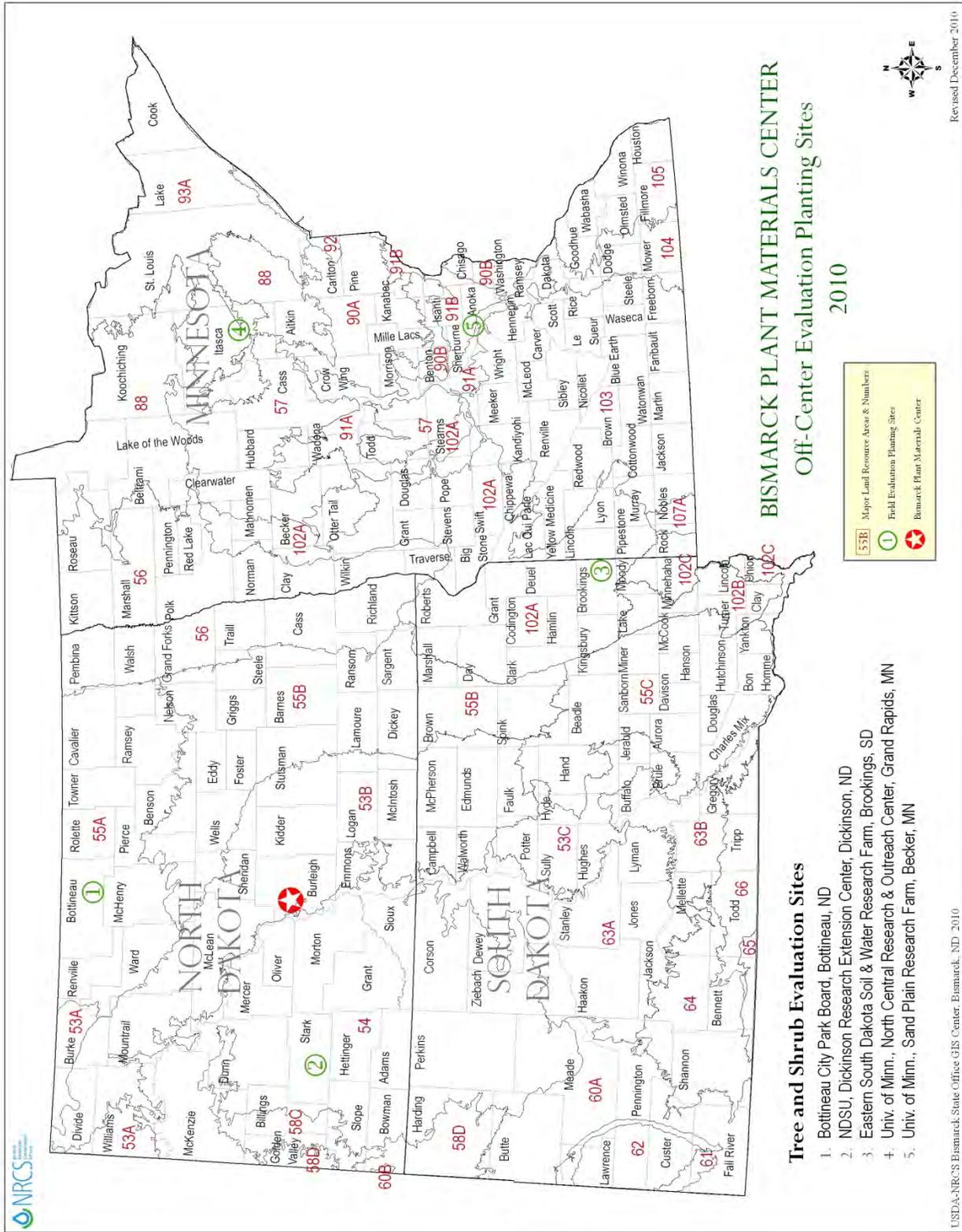
North Dakota and Minnesota are the two coldest States in the nation excluding Alaska. Mean annual temperatures range from 36 degrees F to 48 degrees F for all reporting stations. Plant hardiness zones (USDA) vary from 2 to 5 with mean minimum temperatures between -10 degrees F and -50 degrees F. Annual 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.

The diversity of woody species is limited because of cold and drought, especially in the Dakotas. The scarcity of native tall tree species for windbreaks has relegated at least a portion of the tree improvement effort in the Northern Great Plains to improving upon existing cultivars of native species or increasing survival and pest resistance of hardy exotics such as Siberian elm. Species from Siberia, Russia, Manchuria, or Mongolia are among the most viable introductions for prairie plantings where precipitation is generally less than 20 inches annually. There is generally little shortage of shrub species suited for shelterbelt, barrier, or wildlife plantings except in the most hostile environments or specific cases related to pest resistance.

The short growing season limits the potential annual growth rate of trees. Late spring frosts can affect fruit set of early flowering fruit trees following a week or so of warm temperatures. However, hardy native shrubs like plum, chokecherry, and hawthorn are well adapted and regularly produce abundant crops. Indigenous species may rely on a secondary bud flush to produce foliage in some years. Winter dessication of needle leaved evergreens is not uncommon on exposed sites, making conifer establishment a challenge for vast areas of the Northern Plains. Symptoms of winter injury on hardwoods may be as mild as tip dieback on exterior limbs to complete death of above ground stems and subsequent resprouting. Damaged trees are ideal sites for insects and disease infection.

The importance of adapted seed sources and the need for provenance tests is especially critical in the extreme and variable environment of the Northern Plains. In the three-State region served by the PMC, winter hardy, drought, and pest resistant cultivars are in demand by the nursery trade. Seed sources from regions further south frequently express superior growth rates but are more susceptible to winter injury.

MAPS



ASSEMBLY AND INITIAL EVALUATION

Off-Center Evaluation Plantings

OFF-CENTER EVALUATION PLANTINGS: TECHNICAL REPORT – 2010

Study 38I308K Bottineau City Park Board, Bottineau, North Dakota.

Study Title: Field Evaluation of Woody Plant Materials.

Introduction: There is a need to evaluate the performance of shrub and tree species/cultivars for windbreaks, wildlife, and recreational plantings under diverse soil and climatic conditions. To meet this need, field evaluation planting sites representative of the major land resource areas were located in the three states served by the PMC. These sites provide planting locations under long-term land tenure for assemblies of trees and shrubs to be evaluated under uniform culture and management. New material can be added on an annual basis. Comparisons are then made with previously released cultivars and area of adaptation determined.

Objective: The objective is to assemble and evaluate woody plant materials for conservation use. Superior cultivars will be selected and released for increase by commercial nurseries.

Cooperators: The USDA Natural Resources Conservation Service, Plant Materials Center, Bismarck, North Dakota, in cooperation with the Bottineau City Park Board and the Turtle Mountain Soil Conservation District. The cooperative agreement expired July 19, 2009, with 2010 being the last year of observation.

Location: This project is located within the city limits of Bottineau, on land operated by the Bottineau City Park Board. Legal description: SE 1/4 sec. 25, T. 162 N., R. 75 W., Bottineau County, North Dakota. A sign has been erected to notify visitors.

Major Land Resource Area: The site is located in Major Land Resource Area 55A, Black Glaciated Plains. This nearly level glacial plain is bordered by rolling morainic hills along the western edge. Local relief is low in most areas. Elevation is 1,635 feet. Twenty-five percent of the area is rangeland.

Soils: There are three different soils mapping units in the planting sites: Barnes Svea Tonka complex (12), Hamerly loam (19), and Vallers loam (21). This was once a landfill site.

The Barnes-Svea complex (12) consists of deep, moderately well-drained and well-drained, loam to clay loam material formed in calcareous glacial till on till plains and moraines. The surface layer is black loam or clay loam 7 to 9 inches thick. The subsoil is olive dark brown loam or mottled clay loam. Substratum is olive brown loam or grayish-brown clay loam. Permeability is moderately slow and water holding capacity is good. Slopes are 0-1 percent. The Barnes soils belong to windbreak suitability group 3. The Svea soils belong to the windbreak suitability group 1. They are well-drained, moderately deep to deep loamy soils. If moisture is conserved, these soils are well-suited to all types of windbreaks and other plantings. Wind and water erosion are the only hazards.

The Hamerly series (19) consists of very deep, somewhat poorly or moderately well-drained soils that formed in calcareous loamy glacial till. Permeability is moderate in the upper horizons and moderate or moderately slow in the lower horizons. These soils are on flats on lake plains and on convex slopes surrounding shallow depressions and on slight rises on till plains. They have slopes ranging from 0 to 6 percent.

The Vallers series (21) consists of deep, poorly drained soils that formed in calcareous loamy glacial till on glacial moraines. These soils have moderately slow permeability. Slopes range from 0 to 3 percent.

Climate: For MLRA 055A, the average annual precipitation is 14 to 20 inches; with wide fluctuations year to year. Rainfall is highest from late spring to early autumn. Winter precipitation is snow. The average annual temperature is 36 to 41 degrees F. The average freeze-free period is 100 to 145 days, increasing from north to south. The plant hardiness zone is 3a, with an average annual minimum temperature of -40 to -30 degrees F. Climatic data for 2010 recorded at Bottineau, North Dakota, is shown in Table BO-1.

Methods and Materials

Assembly: Refer to Table BO-2 for a list of woody species planted from 1978 through 2010.

Planting Plan: The plots are not randomized or replicated but systematically arranged for ease of evaluation and demonstration purposes. The evaluation planting originally consisted of four planting blocks. Block I had a total of 45 rows which are no longer being evaluated. Blocks II and III are located several hundred yards north of Block I (See Figure BO-1). Rows run north-south. The single non-replicated plots consist of 1 to 5 plants. Spacing between rows is 10 to 20 feet. Standards of comparison are used when available.

Plot Preparation: A clean, firm planting site was prepared annually by disking and harrowing.

Planting Method: All trees and shrubs were hand planted using approved forestry methods.

Planting Date: Refer to Table BO-2 for planting dates of species planted from 1978 through 2010. Replacements are planted the year after establishment if available.

Fertilization: No fertilizer has been applied to planting area.

Weed Control: No herbicide was applied to any plot during year of establishment. Quackgrass was treated with Glyphosate in Block III in the spring 1985. Weeds were controlled in Blocks II and III by clean cultivation between and within rows. Two to three tillage operations were used in the months of May through August. No hand hoeing has been done in the past five years. A permanent sod cover of ryegrass was established in Block I in 1981.

1994: All blocks were spot sprayed with glyphosate in June. In July, a rotary tree cultivator (attached to JD2240) was used between trees within rows. In September, the thistles were sprayed with Stinger. In October, Casaron was applied at a rate of 150 lb/ac in Blocks II and III.

1995: Roundup was used to spot spray in July.

Biological Control: No insecticides or animal repellents were applied.

Irrigation: Each year, newly planted materials were watered by hand. No water was applied following year of establishment.

Crop Residue Management: No cover crop has been planted in Blocks II and III. Block I is in permanent sod. The grass is mowed annually.

Silvicultural Practices: Dead trees and broken branches have been cut and removed for sanitation. A minimum of pruning was done in 1980 to improve tractor accessibility in rows 1 through 19.

In September 1981 and 1982, and May 1985 and 1986, extensive roguing and pruning of dead or diseased trees and branches were done on Block I. Contaminating species were cut and removed. All mulberry and honeylocust sustained severe winter injury and were removed in 1985. In September 1989, all Russian olive accessions in Block I were removed.

In 2001, a number of accessions in Block III were removed to make room for new material.

In 2007, a number of accessions were cut. Removing poor performing accessions is an ongoing process.

Evaluations and Measurements: Records of planting date, survival, vigor, cold hardiness, canopy width, and height have been maintained since 1974. Selected data appears in this report. Additional data can be requested from the PMC. Plant performance data is recorded during the growing season for three years. After the third year, data is gathered according to a specific schedule. Notes are recorded on survival, vigor, canopy width, plant height, and seed amount. Annual summary reports have been prepared since 2006 and can be requested from the PMC.

Results

Plant Performance: Seventy-nine accessions of 58 species are currently under evaluation. Overall, weeds have been adequately maintained at this site. While this site does receive added protection from surrounding shelterbelts and benefits from an improved microclimate within city limits, it remains our coldest (most northern) testing location. As such, winter injury to southern seed sources is often the most striking feature. In 1999, most of the land was leased to the Bottineau City Park Board. Mean data for individual accessions of trees and shrubs are recorded in Table BO-2. The following accessions exhibit potential for further evaluation and use:

<u>Accession Number</u>	<u>Genus/Species Origin/Source</u>	<u>Plot Location</u>
ND-21 9034900 PI-560908	nannyberry <i>Viburnum lentago</i> USDA, ARS, Mandan, ND	II/03/N-S
ND-170 9005728	European cotoneaster <i>Cotoneaster integerrimus</i> USDA, NRCS, PMC, Bismarck, ND	II/02/16-20
9057409	American hazel <i>Corylus americana</i> Turtle Mountains, Bottineau, ND NDFS	II/04/11-15
9047238	seaberry <i>Hippophae rhamnoides</i> PFRA, Indianhead, Saskatchewan	II/02/1-5
‘Meadowlark’	forsythia <i>Forsythia ovata x europaea</i> Lee Nursery, Fertile, MN	II/04/1-5

Figure BO-1. Bottineau Woody Field Evaluation Planting - Plot Layout

Block II (95 feet long)				Row
North ----->				No.
	ND-428 black walnut	Flame amur maple	9082712 bittersweet	1
ND-170 E. cotoneaster	90047236 false indigo	Survivor false indigo	9047238 seaberry	2
<----- ND-21 nannyberry ----->				3
ND-3744 Korean barberry	9057409 American hazel		Meadowlark forsythia	4
<----- Magenta crabapple ----->		ND-2106 hardy almond	323957 chokeberry	5
<----- 9063098 black walnut ----->		<----- Midwest crabapple ----->		6
	9087732 bur oak		Freedom honeysuckle	7
<----- ND-3796 white poplar ----->		<----- 9063141 native cottonwood ----->		8
<----- 9091967 pin cherry ----->		<----- McDermid Ussurian pear ----->		9
<----- ND-1759 green ash ----->		<----- Cardan green ash ----->		10
<----- ND-686 Pekin lilac ----->		<----- ND-3207 green ash ----->		11
<----- Raverdeau poplar ----->		<----- ND-3779 Manchurian poplar ----->		12
<----- 9008183 Sheridan source common chokecherry ----->		<----- 9069081 littleleaf linden ----->		13
<----- Assiniboine poplar ----->		<----- Prairie Harvest hackberry ----->		14
		<----- Oahe hackberry ----->		15
<----- ND-3898 Harbin pear ----->		<----- 9069090 quaking aspen ----->		16
<----- 9057410 hackberry ----->		<----- ND-3825 silver maple ----->		17
		<----- 9057412 bur oak ----->		18
<----- 9063115 green ash ----->		<----- 9063116 black ash ----->		19
				20
				21
			revised 5/10	

Figure BO-1 (continued)

Row	Block III (60 feet long)	
No.		
1	<----- 9069164 Scots pine ----->	
2	<----- 9076719 Scots pine ----->	
3	<----- 9076718 Scots pine ----->	
4	ND-81 sloe	ND-46 juneberry Success juneberry
5	Bighorn skunkbush sumac	ND-629 amur maple
6	<----- ND-26 honeysuckle ----->	
7	<----- ND-11 amur honeysuckle ----->	
8	<----- Regal Russian almond ----->	
9	9082684 smooth sumac	9082738 gray dogwood
10	Arnolds Red honeysuckle	9063143 tatarian honeysuckle
11	9069129 Amur chokecherry	9069128 tatarian honeysuckle
12a	9082747 American cranberrybush	ND-633 false indigo
12b	9082687 black currant	9091964 skunkbush sumac
13	9082891 common ninebark	9076686 roundleaf hawthorn
14	9094281 American cranberrybush	9091969 Russian peashrub
15	Indigo silky dogwood	ND-3889 dogwood
16	Roselow Sargents crabapple	ND-3888 cotoneaster
17	ND-3887 caragana	ND-3892 tatarian honeysuckle
18	ND-3893 American plum	ND-3894 sandcherry
19	Centennial cotoneaster	ND-3896 Nanking cherry
20	ND-3900 late lilac	ND-3901 common lilac
21	Prairie Red hybrid plum	
	North ----->	revised 5/10

Table No. BO-1: 2010 Weather Summary - Official Station - Bottineau, North Dakota					
Month	Mean Temperature		Precipitation (inches)		
	(degrees Fahrenheit)		Actual		Deviation from Normal
	2010	Normal*	2010	Normal*	2010
January	7.0	3.0	1.23	0.49	0.74
February	6.8	10.5	0.95	0.46	0.49
March	28.8	22.9	0.20	0.79	-0.59
April	45.5	39.7	2.47	1.22	1.25
May	51.9	53.8	3.75	2.16	1.59
June	61.1	62.4	5.94	3.29	2.65
July	66.7	66.7	2.14	3.04	-0.90
August	66.8	65.5	4.35	2.62	1.73
September	53.0	54.4	2.71	1.94	0.77
October	46.0	41.4	2.69	1.27	1.42
November	24.7	23.2	1.86	0.66	1.20
December	7.3	8.5	2.15	0.51	1.64
Annual	38.8	37.7	30.44	18.45	11.99
* National Climate Data Center 1971-2000 Monthly Normals					
		2010			
	Last Frost (28 degrees)	9-May			
	First Frost (28 degrees)	18-Sep			
	Frost Free Period	131 days			

Key to Table BO-2. 38I308K Field Evaluation of Woody Plant Materials – Bottineau, North Dakota

PLOT LOCATION = plot location of the plant material within the evaluation

ACCESSION NUMBER = any accession number, PI number or cultivar name assigned to the plant material

PLANT SYMBOL = plant symbol of the genus and species (asterisk indicates the symbol is not official)

GENUS/SPECIES = common name and scientific name of the plant material

ORIGIN/SOURCE = origin and/or source of the plant material

TRANS DATE = month and day the plant material was transplanted at the evaluation site

YR PLT = year the plant materials were transplanted at the evaluation site

YR REC = year of record

MATL PLTD = type of material planted, PLBR = bareroot, CONT = containerized

NO PLTS = number of plants planted in the plot

NO SRV = number of plants surviving

PCT SRV = percent of plants surviving

VI = plant vigor (1=excellent, 3=good, 5=fair, 7=poor, 9=very poor)

CAN COV (ft) = canopy cover measured in feet

PLT HT (ft) = plant height measured in feet

Table BO-2.

Project No.: 38I308K Field Evaluation of Woody Plant Materials, Bottineau, North Dakota

Year of Record: 2010

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>COV</u>	<u>HT</u>	
												(ft)	(ft)	REMARKS
sign	9082706	ROAR3	prairie rose	16-May	03	03		5	5	100	4	1.0	0.9	
			<i>Rosa arkansana</i>			04			5	100	3	1.6	1.5	
			Lincoln-Oakes Nursery, Bismarck, ND			05			5	100	3			3.0 spreading, somewhat weedy
						09			4	80				1.3
						10			0	0				removed, quackgrass competition
II/01/1-5	9082712	CESC	bittersweet	14-May	02	02	PLBR	5	5	100	4	0.7	1.3	
			<i>Celastrus scandens</i>			03			5	100	5	0.6	0.7	
			Lincoln-Oakes Nursery, Bismarck, ND			04			5	100	4	0.7	1.8	suckers on 4,5
						06			5	100	4	1.0	1.3	
						08			5	100	4	1.2	1.5	
II/01/6-10	'Flame' PI-483442	ACGI	amur maple	5-May	87	87	PLBR	5	4	80	4	0.9	1.6	
			<i>Acer ginnala</i>			88			3	60	4	2.1	2.7	
			USDA, SCS, PMC, Elsberry, MO			89			5	100	4	1.7	2.5	
						91			3	60	3	5.6	5.3	
						93			3	60		6.2	6.7	
						96			3	60	3	7.2	9.4	
						01			3	60	3	14.5	12.3	
						06			3	60	3	17.5	14.3	
II/01/11-15	ND-428 9005970	JUNI	black walnut	6-May	85	85	PLBR	2	2	100	4	0.8	0.9	
			<i>Juglans nigra</i>			86			1	50	2	1.6	2.0	
			NDSU, Fargo, ND			87			1	50	4	3.4	2.1	
						89			1	50	5	6.6	4.3	
						91			1	50	3	8.9	6.7	
						94			1	50		11.8	9.8	
						99			1	50	3	13.5	16.7	
						04			1	50	3	21.5	21.3	
						09			1	50	2	26.5	23.0	

Project No.: 38I308K Field Evaluation of Woody Plant Materials, Bottineau, North Dakota

Year of Record: 2010

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT		CAN COV (ft)	PLT HT (ft)	REMARKS
										SRV	VI			
II/02/1-5	9047238	HIRH80	seaberry <i>Hippophae rhamnoides</i> PFRA, Indianhead, Saskatchewan Lincoln-Oakes Nursery, Bismarck, ND	5-May	87	87	PLBR	5	2	40	4	1.0	2.0	
										40	4	1.9	3.4	
										40	4	1.6	3.2	
										80	3	2.2	3.1	
										80	4	3.5	4.8	
										100		5.1	6.4	heavy fruit crop, sprout
										80	2	12.5	9.8	
II/02/6-10	Survivor germplasm 9008041	AMFR	false indigo <i>Amorpha fruticosa</i> USDA, SCS, PMC, Aberdeen, ID	5-May	87	PLBR	5	5	100	5	1.9	1.9		
									60	3	3.6	3.0		
									60	3	4.1	3.5		
									100	3	5.7	4.3		
									100	3	5.0	5.0		
									100	2	11.8	8.5	solid	
									100	3	14.5	6.0		
II/02/11-15	9047236	AMFR	false indigo <i>Amorpha fruticosa</i> Lincoln-Oakes Nursery, Bismarck, ND	5-May	87	PLBR	5	5	100	4	1.2	1.9		
									100	4	2.4	2.4		
									100	3	3.9	2.9		
									100	3	6.5	3.3		
									100	4	6.9	4.3		
									100	3	11.8	6.1		
									100	3	14.5	6.0		
II/02/16-20	ND-170 9005728	COIN16	European cotoneaster <i>Cotoneaster integerrimus</i> USDA, SCS, PMC, Bismarck, ND	8-May	90	CONT	5	5	100		0.5	1.0		
									100	3	1.5	1.8		
									100	3	2.1	2.2	4 plts have fruit	
									100	3	3.8	3.1		
									100	2	6.6	3.8	heavy fruit crop	
									100	2	8.2	4.9		
									100	1	12.5	6.2		
II/02/16-20	ND-170 9005728	COIN16	European cotoneaster <i>Cotoneaster integerrimus</i> USDA, SCS, PMC, Bismarck, ND	8-May	90	CONT	5	5	100	3	11.0	6.8		
									100	3	11.0	6.8		

Project No.: 38I308K Field Evaluation of Woody Plant Materials, Bottineau, North Dakota

Year of Record: 2010

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN COV (ft)	PLT HT (ft)	REMARKS			
														VI		
II/03/1-10	ND-21 9034900 PI-560908	VILE	nannyberry	5-May	86	86	PLBR	10	10	100	3	0.3	0.6			
			<i>Viburnum lentago</i>							87	5	50	4	0.5	1.2	
			USDA, ARS, Mandan, ND							88	10	100	5	0.6	1.2	
			USDA, SCS, PMC, Bismarck, ND							90	6	60		0.8	1.5	
			92							6	60	3	1.7	2.5		
			95							6	60	2	4.6	4.9		
			00							6	60	2	6.7	7.6		
			05							6	60	2	7.9	8.5		
			10							6	60	3	11.0	9.6		
			II/04/1-5							'Meadowlark' 9005886	FOOV80	forsythia	8-May	89	PLBR	5
<i>Forsythia ovata X europaea</i>	90	2		20		0.5	0.7									
Lee Nursery, Fertile, MN	91	4		80	4	1.3	1.5									
NDSU, Fargo, ND	93	4		80	4	2.2	3.3									
95	4	80		4	3.7	4.3										
98	4	80		2	5.9	5.5										
03	4	80		3	8.0	7.7										
08	4	80		4	9.0	8.5										
II/04/11-15	9057409	COAM3	American hazel	10-May	88	PLBR	5	0	0							
			<i>Corylus americana</i>						89	5	100	4	0.9	1.3		
			Turtle Mountains						90	4	80	3	1.0	1.1		
			NDFS, Bottineau, ND						92	4	80	3	1.5	1.5		
			94						4	80	3	2.5	2.5			
			97						4	80	2	3.9	3.0			
			05						4	80	1	6.6	6.2			
			07						4	80	2	8.0	9.0			
II/04/16-20	ND-3744 9019577	BEKO2	Korean barberry	10-May	88	CONT	5	0	0							
			<i>Berberis koreana</i>						89	2	40		0.5	0.6		
			NDSU						90	2	40	6	0.3	0.9		
			McKenzie FEP, ND						92	2	40	4	1.5	1.6		
			94						2	40	4	2.3	3.1			
			97						2	40	5	2.3	2.3			
			02						1	20	2	6.0	5.0			
			07						1	20	3	7.5	6.5			

Project No.: 38I308K Field Evaluation of Woody Plant Materials, Bottineau, North Dakota

Year of Record: 2010

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN COV (ft)	PLT HT (ft)	REMARKS	
														VI
II/06/6-10	9063098	JUNI	black walnut <i>Juglans nigra</i> Big Sioux Nursery, Watertown, SD	6-May	91	91	PLBR	5	5	100	4	1.0	1.8	
										100	4	0.7	2.2	Tubex on all
										100	4	1.2	3.0	
										100	3	2.5	4.3	
										100	3	3.0	5.0	
										100		6.4	9.5	Tubex removed
										100	4	11.8	12.8	
										100	3	13.0	18.0	
II/07/1-5	'Freedom' 9057424	LOKO2	honeysuckle <i>Lonicera korolkowii</i> Lincoln-Oakes Nursery, Bismarck, ND	8-May	90	90	PLBR	5	5	100	4	1.3	1.5	
										100	3	4.4	4.0	
										100	3	4.1	3.4	all have fruit, all have
										100	2	5.6	6.6	some tip dieback
										100	5	11.3	8.9	
										100		11.8	10.5	
										100	3	17.0	12.0	slight dieback
100	3	17.0	13.3											
II/7/6-10	9087732	QUMA2	bur oak <i>Quercus macrocarpa</i> USDA, NRCS, PMC, Bridger, MT	11-May	09	09		5	5	100	3	1.0	2.1	
										60	4	1.0	1.4	
II/08/1-5	9063141	PODE3	eastern cottonwood <i>Populus deltoides</i> Lincoln-Oakes Nursery, Bismarck, ND	11-May	93	93	PLBR	5	5	100	3	1.3	3.0	
										100	3	3.2	5.6	
										100	1	6.7	9.9	
										100	2	9.3	16.3	
										100		10.8	23.2	
										100	4	11.5	20.8	
										40	3	17.8	35.9	
II/08/6-10	9030611 ND-3796	POAL7	white poplar <i>Populus alba</i> Turner Co., SD McKenzie FEP, ND	11-May	93	93	CONT(P)	5	3	60	5	1.4	1.2	plt 3,4 had competition from
										40	4	1.3	2.3	apricot sprouts
										40	2	6.2	5.8	
										40	2	6.5	8.7	
										40	3	13.6	17.2	
										40		11.0	17.6	
										40		14.0	24.1	

Project No.: 38I308K Field Evaluation of Woody Plant Materials, Bottineau, North Dakota

Year of Record: 2010

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN COV (ft)	PLT HT (ft)	REMARKS	
														VI
II/09/1-5	'McDermant' ND-14 9006095 PI-478004	PYUS2	Ussurian pear <i>Pyrus ussuriensis</i> Res. Sta., Morden, MB, Canada	6-May	81	81	CONT	5	5	100	4	0.9	2.0	
												2.3	3.5	
												2.6	5.2	
												5.5	8.1	
												7.2	10.4	
												9.7	11.2	
												9.8	11.8	
												11.7	17.0	
												14.4	18.6	
												17.0	18.6	
18.0	20.6													
II/09/6-11	9091967	PRPE2	pin cherry <i>Prunus pensylvanica</i> Big Sioux Nursery, Watertown, SD	13-May	08	08		5	4	80	4	0.8	1.8	
										100	6	0.6	1.1	1 top all dead
										60	4	0.8	1.4	
II/10/1-5	'Cardan' 9005895 PI-469226	FRPE	green ash <i>Fraxinus pennsylvanica</i> Carlyle, MT	6-May	81	81	CONT	5	5	100	3	1.3	3.0	
										100	3	3.9	5.7	
										100	4	5.0	7.0	severe ash plant bug
										100	3	8.4	11.5	
										100	3	10.9	14.4	
										100	4	11.1	16.3	
										100	3	11.5	20.0	
										100	3	13.5	24.3	
										100	2	24.6	28.7	
										100	2	18.0	26.7	
100	2	23.0	29.2											

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Year of Record: 2010

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN COV (ft)	PLT HT (ft)	REMARKS		
														VI	
II/10/6-10	ND-1759 9005893	FRPE	green ash	6-May	81	81	PLBR	5	5	100	3	1.3	2.8		
			<i>Fraxinus pennsylvanica</i>			82				5	100	3	3.5	5.6	
			SD-156 X 'Cardan'			83				5	100	5	3.7	6.7	severe ash plant bug, leaf rust
			USDA, SCS, PMC, Bismarck, ND			85				5	100	3	7.0	11.0	
						87				5	100	4	10.3	14.9	
						90				4	80		11.6	17.5	
						95				5	100	4	13.1	20.9	
						00				5	100	3	15.2	24.9	
						05				5	100	3	24.6	26.4	
						10				5	100	3	23.0	27.3	
II/11/1-5	ND-3207 9011849	FRPE	green ash	27-Apr	82	82	PLBR	5	5	100	3	1.1	3.8		
			<i>Fraxinus pennsylvanica</i>			83				5	100	5	1.9	5.5	moderate ash plant
			Hettinger Co., ND			84				5	100	2	3.6	6.4	bug, leaf rust
						86				5	100	3	8.2	10.2	
						88				5	100	3	8.9	12.2	
						91				5	100	4	10.8	15.0	
						96				5	100	3	12.4	19.4	
	01		5	100	3	17.7	22.8								
II/11/6-10	ND-686 9006225 PI-478008	SYPE4	pekin lilac	27-Apr	82	82	PLBR	5	2	40		1.1	1.2		
			<i>Syringa pekinensis</i>			83				2	40	5	1.9	2.4	
			Res. Sta., Morden, MB, Canada			84				5	100	6	1.4	1.7	
			USDA, SCS, PMC, Bismarck, ND			86				3	60	3	4.1	3.5	
						88				2	40	4	7.7	7.3	
						91				3	60	3	6.7	7.1	
						96				2	40	5	10.9	11.9	
						01				2	40	3	16.0	15.5	
	06		2	40	3	12.8	17.9								

Project No.: 38I308K Field Evaluation of Woody Plant Materials, Bottineau, North Dakota

Year of Record: 2010

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN COV (ft)	PLT HT (ft)	REMARKS	
														VI
II/12/1-5	ND-3779 9029137	POLA82	Manchurian poplar <i>Populus laurifolia</i> Lee Nursery, Fertile, MN	27-Apr	82	82	CONT	5	5	100	3	3.1	4.2	good-excellent growth and vigor
										100	1	5.9	8.6	
										100	1	8.3	14.0	
										100	2	11.2	19.5	
										100	3	12.8	22.3	
										100	4	13.5	25.2	
										100	3	15.7	30.7	
										100	3	20.0	35.0	
II/12/6-10	'Raverdeau' 9069085	POPUL	hybrid poplar <i>Populus</i> Lee Nursery, Fertile, MN	12-May	93	93	PLBR	5	5	100	3	1.0	3.0	
										100	3	1.6	4.7	
										100	3	5.1	7.8	
										100	3	6.9	13.0	
										100	3	9.3	23.0	
										100	4	10.2	24.3	
										100	6	10.0	22.0	
II/13/1-5	9069081	TICO2	littleleaf linden <i>Tilia cordata</i> Lee Nursery, Fertile, MN	12-May	93	93	PLBR	5	5	100	5	0.8	1.2	
										80	4	1.5	1.7	
										100	3	2.5	1.9	
										60	5	2.6	2.0	
										60	4	3.8	4.6	
										60	5	6.5	5.8	
II/13/6-10	9008183	PRVI	common chokecherry <i>Prunus virginiana</i> Lincoln-Oakes Nursery, Bismarck, ND	3-May	05	05	PLBR	5	5	100	5	0.7	1.9	
										100	4	1.2	2.3	
										80	3	2.2	4.4	
										80	3	3.9	6.6	
II/14/1-5	Prairie Harvest Germplasm 9034956 ND-3878	CEOC	hackberry <i>Celtis occidentalis</i> Polk County, Minnesota	11-May	09	09			4	80	5	0.4	1.3	all appear to have tips damaged all died, severe weed competition
										0	0			

Project No.: 38I308K Field Evaluation of Woody Plant Materials, Bottineau, North Dakota

Year of Record: 2010

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT		CAN COV (ft)	PLT HT (ft)	REMARKS
										SRV	VI			
II/14/6-10	'Assiniboine' 9063147	POPUL	hybrid poplar <i>Populus</i> PFRA, Indianhead, Saskatchewan	12-May	93	93	PLBR	5	4	80	6	0.5	1.6	
										100	5	1.0	2.8	
										100	3	2.8	4.4	
										80	5	4.3	7.5	
										80	4	5.0	15.1	
										80	4	6.5	18.4	
										60	4	10.3	24.2	
II/15/1-5	'Oahe'	CEOC	hackberry <i>Celtis occidentalis</i>	11-May	09	09		5	2	40	4	0.9	1.0	
										40	4	0.6	2.8	
II/16/1-5	9069060	POTR5	quaking aspen <i>Populus tremuloides</i> Lee Nursery, Fertile, MN	12-May	93	93	PLBR	5	0	0				did not establish
										100	4	1.1	3.1	replants
										80	2	3.3	5.2	
										80	2	3.8	6.6	
										80	3	5.1	11.0	
										80	3	6.1	14.2	
										60	3	8.3	18.8	
II/16/6-10	ND-3898 9035208	PYUS2	Ussurian pear <i>Pyrus ussuriensis</i> Lawyer Nursery, Plains, MT	25-May	83	83	PLBR	5	1	20	5	0.3	1.5	
										80	5	0.9	1.2	
										100	4	1.1	2.3	
										60	3	4.2	5.9	
										60	4	5.4	7.3	
										60		9.0	10.7	
										60	8	15.9	13.1	
										60	5	12.2	14.2	
										60		13.0	15.0	

Project No.: 38I308K Field Evaluation of Woody Plant Materials, Bottineau, North Dakota
Year of Record: 2010

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT		CAN COV (ft)	PLT HT (ft)	REMARKS
										SRV	VI			
II/17/1-5	ND-3825 9034904	ACSA2	silver maple <i>Acer saccharinum</i> Bismarck, ND	25-May	83	83	CONT	5	5	100	5	0.3	1.0	
										100		0.4	1.1	
										60	5	0.8	2.1	
										40	2	2.2	4.6	
										80	4	3.5	4.7	
										40	6	4.6	5.7	
										40	4	9.5	11.2	
										40	5	21.0	17.6	
										40	5	20.5	18.4	
										40	6	20.0	15.0	
II/17/6-10	9057410	CEOC	hackberry <i>Celtis occidentalis</i> Bottineau Co., ND NDFS	10-May	88	CONT	5	4	80		0.3	0.7		
									20		0.7	0.8		
									100		0.6	1.1		
									100	4	1.5	2.8	Tubex on 4 of trees	
									100	4	3.4	4.6		
									100	3	6.8	9.0		
									100		8.8	13.6		
									100		12.6	16.8		
II/18/1-5	9057412	QUMA2	bur oak <i>Quercus macrocarpa</i> Foster Co., ND NDFS	10-May	88	CONT	5	1	20		0.5	1.0		
									20		0.5	0.7		
									100	7	0.4	0.9		
									80	7	0.5	1.0		
									80	4	1.1	1.9		
									80	2	1.8	4.0		
									80	4	7.0	8.8		
									80	3	8.8	12.4		
II/19/1-5	9063116	FRNI	black ash <i>Fraxinus nigra</i> Itasca State Park, MN	5-May	94	CONT	5	5	100	4	0.9	1.4		
									100	3	1.6	3.6		
									100	3	2.2	4.8		
									100	5	2.6	7.5		
									100	3	2.4	8.8		
									100	3	4.3	12.6		
									80	2	8.2	18.2		

Project No.: 381308K Field Evaluation of Woody Plant Materials, Bottineau, North Dakota

Year of Record: 2010

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT		CAN COV (ft)	PLT HT (ft)	REMARKS
										SRV	VI			
II/19/6-10	9063115	FRPE	green ash <i>Fraxinus pennsylvanica</i> Itasca State Park, MN	5-May	94	94	CONT	5	5	100	4	0.7	1.3	
										100	3	1.4	2.9	
										100	4	2.2	4.0	cut off
										100	5	3.3	6.3	
										100	5	3.8	8.1	
										100	2	6.9	13.3	
III/01/1-5	9069164	PISYM	Scots pine <i>Pinus sylvestris</i> var. <i>mongolica</i> People's Republic of China, Heilongjiang Province	14-May	02	02	CONT	5	3	60	3	1.0	2.4	
										80	4	1.0	2.4	
										80	3	1.3	3.0	
										100	4	1.9	3.8	
										100	4	2.8	4.8	
III/02/1-5	9076719	PISYM	Scots pine <i>Pinus sylvestris</i> var. <i>mongolica</i> People's Republic of China, Heilongjiang Province	14-May	02	02	CONT	5	3	60	3	1.0	2.2	
										80	4	0.7	2.3	
										40	4	0.6	2.9	
										80	4	1.3	3.2	
										40	4	1.9	4.0	
III/03/1-5	9076718	PISYM	Scots pine <i>Pinus sylvestris</i> var. <i>mongolica</i> People's Republic of China, Heilongjiang Province	14-May	02	02	CONT	5	3	60	3	1.4	2.2	
										100	3	1.1	2.5	
										100	3	1.1	3.0	
										80	3	2.8	5.1	
										60	2	3.5	6.2	
III/04/1-3	ND-81 9006078	PRSP	sloe <i>Prunus spinosa</i> Res. Sta., Morden, MB, Canada	24-May	78	78	PLBR	3	2	67	3	0.8	1.2	
										67	3	2.1	2.0	
										67	6	2.1	1.7	
										67	5	4.3	5.2	
										67	4	5.2	6.0	mildew
										67	5	5.9	6.2	
										67		8.5	7.9	
										57	5	6.4	7.4	
										33	4	14.4	10.3	
										33	3	15.0	9.5	
										33	3	17.0	12.0	

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Year of Record: 2010

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN		REMARKS		
											COV (ft)	PLT (ft)			
III/06/1-8	ND-26 9011852	LONIC	honeysuckle <i>Lonicera</i> USDA, ARS, Mandan, ND	24-May	79	79	PLBR	8	8	100	4	1.4	1.5		
												5	2.3		
												5	3.7		
												4	5.6	5.7 excellent fruit,	
												3	7.9	7.1 slight honeysuckle aphid,	
												4	9.0	8.2 witches broom, mildew	
													88	9.5	
												5	13.5	10.2	
													88	10.8	11.0
													8	100	4
III/07/1-10	ND-11 9005993 PI-477998	LOMA6	amur honeysuckle <i>Lonicera maackii</i> Res. Sta., Morden, MB, Canada	6-May	81	81	CONT	10	10	100	5	1.6	1.5		
												4	3.7	3.0	
												4	4.1	3.5 leaf wilt,	
												3	5.9	4.7 leaf scorch	
												3	8.2	7.0	
												3	7.7	6.3	
												4	9.2	6.8	
												3	9.8	8.3	
												4	11.9	9.8	
												3	11.2	10.5	
	10	100	3	12.5	12.0										
III/08/1-10	'Regal' ND-283 9006079 PI-540442	PRTE5	Russian almond <i>Prunus tenella</i> NDG&F Dept.	6-May	81	81	CONT	10	10	100	4	1.2	2.5		
												4	3.1	3.4	
												3	3.9	3.8	
												4	5.9	5.0	
												4	7.4	5.3	
												4	7.9	5.3	
												3	7.9	5.6	
												3	11.3	6.1	
												3	13.5	7.3	
												2	15.4	6.6	
	10	100	3	18.0	7.4										

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											COV (ft)	PLT (ft)		
III/09/6-10	9082738	CORA6	gray dogwood <i>Cornus racemosa</i> Wisconsin Lincoln-Oakes Nursery, Bismarck, ND	6-May	03	03		5	5	100	4	0.7	1.5	
											3	0.7	1.9	
											3	1.0	2.0	
											4	1.0	1.7	
											4	1.2	1.3	
III/10/1-5	'Arnolds Red' 9069080	LOTA	red tatarian honeysuckle <i>Lonicera tatarica</i> Lee Nursery, Fertile, MN	12-May	93	93	PLBR	5	4	80	4	1.0	1.5	
											4	1.6	2.1	
											4	2.5	3.1	
											4	3.9	4.6	
											4	4.3	5.4	
											4	5.5	6.9	alot of fruit on all
											4	9.0	9.6	
III/10/6-10	9063143	LOTA	red tatarian honeysuckle <i>Lonicera tatarica</i> Iowa Lincoln-Oakes Nursery, Bismarck, ND	12-May	93	93	PLBR	5	5	100	4	1.2	1.4	
											5	1.2	1.9	
											4	3.5	3.7	
											3	5.3	5.5	
											2	6.0	7.3	
											2	7.5	8.8	
III/11/1-5	9069129	PRMA80	Amur chokecherry <i>Prunus maackii</i> Big Sioux Nursery, Watertown, SD	11-May	94	94	PLBR	5	3	60	2	1.9	3.2	
											2	3.3	5.1	
											3	5.1	6.6	
											2	6.6	8.2	
											1	6.2	12.3	
											2	11.7	13.1	
											5	13.5	12.4	
III/11/6-10	9069128	LOTA	red tatarian honeysuckle <i>Lonicera tatarica</i> Big Sioux Nursery, Watertown, SD	11-May	94	94	PLBR	5	4	80	5	1.0	1.0	
											4	2.9	3.1	
											4	3.4	4.7	herbicide damage
											3	5.8	7.1	
											2	5.3	10.7	
											4	8.6	12.7	
III/11/6-10	9069128	LOTA	red tatarian honeysuckle <i>Lonicera tatarica</i> Big Sioux Nursery, Watertown, SD	11-May	94	94	PLBR	5	4	80	2	11.0	14.0	
											2	11.0	14.0	

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				DATE	PLT	REC	PLTD	PLTS	SRV	SRV	VI	COV (ft)		HT (ft)
III/12a/1-5	9082747	VIOPA	American cranberrybush	07	07		POTD	5	4	80	5	0.5	0.9	
			<i>Viburnum opulus</i> var. <i>americanum</i>		08				3	60	4	0.7	1.1	
			Bottineau County, ND		09				3	60	5	0.8	0.8	
			USDA, NRCS, PMC, Bismarck, ND											
III/12b/1-5	9082687	RIAM2	black currant	07	07		CONT	5	5	100	3	0.8	1.2	
			<i>Ribes americanum</i>		08				5	100	3	1.6	1.5	
			South Dakota		09				5	100	3	1.4	1.3	
			Big Sioux Nursery, Watertown, SD											
III/12b/6-10	9091964	RHTR	skunkbush sumac	07	07		CONT	5	5	100	3	0.9	1.3	weed competition 3,4
			<i>Rhus trilobata</i>		08				5	100	4	1.0	1.4	
			Harding County, SD		09				5	100	3	1.7	1.5	1,2 sprawling
			USDA, NRCS, PMC, Bismarck, ND											
III/13/1-5	9082891	PHOP	common ninebark	26-May	10	10		5	5	100	3	0.8	2.0	
			<i>Physocarpus opulifolius</i>											
			Big Sioux Nursery, Watertown, SD											
III/13/6-10	9076686	CRCH	roundleaf hawthorn	26-May	04	04		5	5	100	4	0.4	0.7	caged
			<i>Crataegus chrysocarpa</i>		05				5	100	4	0.8	1.1	
			Lincoln-Oakes Nursery, Bismarck, ND		06				5	100	3	1.0	1.5	
					08				5	100	3	0.9	2.2	
					10				5	100	3	1.0	2.4	very thick wormwood
III/14/1-5	9082885	POTR5	quaking aspen	26-May	04	04		5	5	100	4	0.3	2.2	
			<i>Populus tremuloides</i>		05				5	100	4	0.6	2.2	
			NDFS Nursery, Towner, ND		06				2	40	4	1.0	2.8	
					08				1	20	8	0.3	1.0	
					10				0	0				
III/14/1-5	9094281	VIOPA2	American cranberrybush	11-May	09	09		5	5	100	5	0.9	1.1	
			<i>Viburnum opulus</i> var. <i>americanum</i>		10				5	100	5	1.4	1.1	
			Minnesota											
			Big Sioux Nursery, Watertown, SD											

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										SRV	VI			
III/14/6-10	90911969	CAFR80	Russian peashrub <i>Caragana frutex</i> Big Sioux Nursery, Watertown, SD	3-May	05	05		5	5	100	3	0.7	3.1	
										100	4	0.8	3.0	
										100	4	1.0	3.2	
										100	4	1.1	3.2	
III/15/1-5	'Indigo' Mich-765 9004971 PI-468117	COAM2	silky dogwood <i>Cornus amomum</i> USDA, SCS, PMC, Rose Lake, MI	25-May	83	83	PLBR	5	5	100	4	0.7	1.3	
										100	4	2.0	1.9	
										100	3	3.0	3.0	
										80	4	6.2	4.3	
										80	4	5.0	4.5	
										80	5	5.6	4.9	
										80	4	9.8	7.2	
										80	3	10.5	8.3	
80	4	11.5	8.0											
III/15/6-10	ND-3889 9035199	COST4	dogwood <i>Cornus stolonifera</i> Lawyer Nursery, Plains, MT	25-May	83	83	PLBR	5	4	80	6	0.5	1.1	
										60	4	0.9	1.8	
										60	3	2.7	2.7	
										60	4	5.7	3.7	
										40	4	5.8	4.4	
										40	2	7.6	5.8	
										40	2	7.6	5.8	
										60	4	10.5	6.3	
		13.0	5.5	a thicket, cannot see individuals										
III/16/6-10	ND-3888 9035198	COAC2	cotoneaster <i>Cotoneaster acutifolius</i> Lawyer Nursery, Plains, MT	25-May	83	83	PLBR	5	5	100	4	1.0	1.4	
										100	4	1.5	1.9	
										100	4	2.4	2.9	
										100	4	5.5	4.3	
										100	3	6.0	5.3	
										100	3	9.8	7.0	
										100	5	8.9	7.5	
										100	3	11.0	9.7	
100	3	11.0	8.0	some dieback but lots of fruit										

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											COV (ft)	PLT (ft)	
III/17/1-5	ND-3887 9035197	CAAR18	caragana <i>Caragana arborescens</i> Lawyer Nursery, Plains, MT	25-May	83	83	PLBR	5	5	100	4	0.5	1.3
											5	0.8	1.9
											4	1.4	2.8
											4	4.3	6.2
											5	5.2	7.1
											5	7.3	9.8
											5	14.6	13.1
											5	15.5	14.8
											5	17.0	16.5
													leggy
III/17/6-10	ND-3892 9035202	LOTA	red tatarian honeysuckle <i>Lonicera tatarica sibirica</i> Lawyer Nursery, Plains, MT	25-May	83	83	PLBR	5	5	100	6	0.6	1.2
											5	1.1	1.9
											3	2.3	2.7
											4	5.3	5.2
											4	6.1	6.2
											4	6.8	8.5
											4	14.3	10.9
											4	12.8	
											4	19.0	15.3
III/18/1-5	ND-3893 9035203	PRAM	American plum <i>Prunus americana</i> Lawyer Nursery, Plains, MT	25-May	83	83	PLBR	5	4	80	6	0.5	1.8
											5	0.9	1.8
											4	1.2	2.4
											4	4.8	5.6
											4	6.9	7.8
											3	8.3	9.5
											4	15.5	12.3
											5	15.0	13.5
											3	18.0	11.8

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														VI
III/19/1-5	'Centennial' ND-177 9005729 PI-113095	COIN16	European cotoneaster <i>Cotoneaster integerrimus</i> USDA, SCS, PMC, Bismarck, ND	6-May	85	85	PLBR	5	5	100	3	0.6	1.1	
												1.8	2.3	
												4.4	3.6	
												5.9	5.4	
												10.8	6.6	
												11.8	8.7	
												9.6	10.4	
												11.0	9.0	fireblight
												13.0	9.8	
III/19/6-10	ND-3896 9035206	PRTO80	nanking cherry <i>Prunus tomentosa</i> Lawyer Nursery, Plains, MT	25-May	83	83	PLBR	5	3	60	8	0.3	0.5	poor quality stock,
												0.3	0.9	failed to establish,
												0.7	1.3	5 cultivated out
												4.4	5.2	
												7.0	5.6	
												6.9	5.0	
												9.0	8.5	
												7.0	7.0	
III/20/1-5	ND-3900 9035210	SYVI3	late lilac <i>Syringa villosa</i> Lawyer Nursery, Plains, MT	25-May	83	83	CONT	5	5	100	8	0.3	1.0	heat stress,
												0.4	0.8	poor quality stock
												0.5	1.2	
												1.3	1.9	
												6.0	3.2	
												4.6	5.6	
												10.2	8.5	
												9.5	10.5	
												10.0	11.5	

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														VI
III/20/6-10	ND-3901 9035211	SYVU	common lilac <i>Syringa vulgaris</i> Lawyer Nursery, Plains, MT	25-May	83	83	CONT	5	5	100	8	0.3	0.5	severe weed competition,
						84			4	80	7	0.3	0.5	moisture stress,
						85			4	80	4	0.5	0.7	5 cultivated out
						87			4	80	4	1.7	2.3	
						89			4	80	4	3.1	3.5	
						92			4	80	4	5.4	5.6	
						97			4	80	2	9.2	9.5	
						02			5	100	2	10.5	10.5	
						07			4	80	6	10.0	9.5	
						III/21/1-5	'Prairie Red' ND-1134 9047203	PRUNU	plum <i>Prunus</i> Miller, SD USDA, SCS, PMC, Bismarck, ND	6-May	85	PLBR	5	3
86			3	60	4							1.1	2.3	
87			2	40	4							2.7	3.2	
88			3	60	4							3.2	4.1	
89			3	60	4							5.0	6.5	
91			3	60	3							8.0	8.5	
94			3	60								9.8	9.1	
99			3	60	3							15.7	12.5	
04			3	60	4							17.0	13.0	



2010 Report Off-Center Evaluation Planting of Woody Plant Materials Bottineau, North Dakota

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INTRODUCTION

The Bismarck Plant Materials Center (PMC) was established in 1954 as part of the Soil Conservation Service, now Natural Resources Conservation Service (NRCS). A principal task of the PMC has always been tree improvement. There is a need to evaluate performance of many tree and shrub species in various conservation plantings, under diverse soils and climate conditions. The PMC is currently testing woody plants at five locations in Minnesota, North Dakota and South Dakota. The City of Bottineau is the northernmost site. The PMC first started evaluating trees and shrubs at Bottineau in 1974, in cooperation with the North Dakota State Forest Service. The soils and climate at Bottineau have had a strong effect on survival. The care and attention that the test site has received over the years is the main reason for its continuation and success. The test site is located on the west side of Bottineau, north of State Highway 5. The predominant soil here is a Barnes-Svea complex.

In 1999, a cooperative agreement was signed with the Turtle Mountain Soil Conservation District and the Bottineau City Park Board. All cooperators have contributed to the maintenance of the site. The current Memorandum of Understanding expired on July 19, 2009.

This summary does not contain the complete list of woody plants being evaluated. A separate report containing all data can be found at the NRCS Area Office at Devils Lake, or the Bismarck Plant Materials Center. Contact Rachel Bergsagel at the PMC for additional species information.

OBJECTIVES

1. Conduct evaluation studies to determine the adaptation and performance of woody plant materials for conservation purposes.
2. Conduct advanced evaluation and progeny testing of selected strains of woody plant materials.
3. Establish seed and plant increase of selected accessions.
4. Develop, release and promote improved plant materials for public use.

RECENT ACTIVITIES

On May 26, 2010, common ninebark (9082891) seedlings were planted in Block III, Row 13 (see updated map with highlighted entry). Replants of American cranberry (9082747) and Prairie Harvest germplasm hackberry were also planted.

Bruce Miller helped evaluate 15 accessions of selected trees and shrubs on Oct. 1, 2010. Measurements were taken of survival, vigor, height and width. A number of the recently planted shrub species are doing well. However, the seedlings of 'Oahe' hackberry and Prairie Harvest germplasm hackberry, first planted in 2009, have done poorly.

The total precipitation at Bottineau for 2010 was above normal, totaling over 29 inches. For most of the growing season, the rainfall was above normal.

Work continued on removing some of the volunteer trees and shrubs in the more established rows. Chokecherry, boxelder, and Siberian elm continue to be a problem. Borax is used to treat the stumps to stop, or at least slow down, the sprouting.

PMC RELEASES

PMC releases that are performing well at Bottineau are 'Midwest' Manchurian crabapple, 'Cardan' green ash, 'McDermant' Ussurian (Harbin) pear, 'Regal' Russian almond, 'Prairie Red' plum, and 'McKenzie' black chokeberry. McKenzie black chokeberry, which was released in 2008, produces a heavy fruit crop useful in making juices and other beverages. The fruit has a deep purple color and is high in antioxidants. There is a lot of interest in this plant among growers and fruit producers in the Midwest and Northern Plains.

Formal Releases with Supporting Documentation from the Bottineau Site

'Midwest' Manchurian crabapple	1973
'Cardan' green ash	1979
'Oahe' hackberry	1982
'Centennial' cotoneaster	1987
'McDermant' Ussurian pear	1990
'Regal' Russian almond	1997
Survivor false indigo	2005
'Prairie Red' hybrid plum	2006
'McKenzie' black chokeberry	2008
Prairie Harvest hackberry	2009

ACKNOWLEDGEMENTS

This research is supported by the NRCS field office, the Turtle Mountain Soil Conservation District at Bottineau, and the Bottineau City Park Board. Appreciation goes to the staff members who help maintain the plots during the growing season.

Helping People Help the Land

All programs and services are offered on a nondiscriminatory basis.

OFF-CENTER EVALUATIONS: TECHNICAL REPORT – 2010

Study 38I316K North Dakota State University, Dickinson Research Extension Center, Dickinson, North Dakota.

Study Title: Field Evaluation of Woody Plant Materials.

Introduction: There is a need to evaluate the performance of shrub and tree species/cultivars for windbreaks, wildlife, and recreational plantings under diverse soil and climatic conditions. To meet this need, field evaluation planting sites representative of the Major Land Resource Areas were located in the three States served by the PMC. These sites provide planting locations under long-term land tenure, for assemblies of trees and shrubs to be evaluated under uniform culture and management. New material can be added on an annual basis. Comparisons are then made with previously released cultivars and area of adaptation determined.

Objective: The objective is to assemble and evaluate woody plant materials for conservation use. Superior cultivars will be selected and released for increase by commercial nurseries.

Cooperators: The USDA Natural Resources Conservation Service, Plant Materials Center, Bismarck, North Dakota, in cooperation with the North Dakota State University, Dickinson Research Extension Center, Dickinson, North Dakota. The cooperative agreement expired January 20, 2010, and is currently in the revision and renewal process.

Location: This project is located on the west edge of Dickinson, North Dakota, on the NDSU Dickinson Branch Experiment Station. Legal description: NE 1/4 sec. 5, T. 139 N., R. 96 W., Stark County, North Dakota.

Major Land Resource Area: The site is located in Major Land Resource Area 54, Rolling Soft Shale Plain. This moderately dissected rolling plain is underlain by calcareous shales and sandstones. Strongly dissected areas of sharp local relief or badland topography border major streams and valleys in some areas. Elevation is 2,411 feet. Sixty percent of the area is rangeland.

Soils: The soil type is a Parshall fine sandy loam. The Parshall series consists of deep, well-drained soils formed in fine sandy loam alluvium on terraces and outwash plains and in upland swales. The surface layer and subsoil is dark grayish-brown fine sandy loam. The underlying material is dark grayish-brown fine sandy loam and loamy fine sand. Permeability is moderately rapid. The available water capacity is moderate. Organic matter is high and fertility is medium. This soil is in North Dakota windbreak suitability group 5.

Climate: For MLRA 054, the average annual precipitation is 13 to 19 inches; increasing from west to east for this semiarid area. Rainfall is highest from late spring to midsummer and very low during the rest of the year. Winter precipitation is snow. Average annual temperature is 40 to 45 degrees F. Average freeze-free period is 110 to 135 days. The plant hardiness zone is 4a, with an average annual minimum temperature of -30 to -20 degrees F. Climatic data for 2010 recorded at Dickinson Research Extension Center, Dickinson, North Dakota, is shown in Table DI-1.

Methods and Materials

Assembly: Refer to Table DI-2 for a list of woody species planted from 1978 through 2010.

Planting Plan: Plots are not randomized or replicated but systematically arranged for ease of evaluation and demonstration purposes. The planting site is approximately 500 feet long and 200 feet wide. The area is divided into five blocks. Each block consists of single row, non-replicated plots. Each plot contains a minimum of 5 plants. Row length is 100 feet and spacing between rows is 20 feet. Block 1A contains mainly tall tree accessions. Block 1B contains conifers. Block 2 contains shrubs and small trees. Block 3 contains medium sized trees. Block 4 contains tall trees. Refer to the plot map in Figure DI-1. All trees are spaced ten feet within row and shrubs are spaced five feet within row. All rows run from west to east. Like species and standards of comparison are established in adjacent plots whenever possible.

Plot Preparation: A clean, firm planting site is prepared annually by disking and harrowing.

Planting Method: All trees and shrubs are hand planted using approved forestry methods.

Planting Date: Refer to Table DI-2 for planting dates of woody species planted from 1978 through 2010. Replacement stock is planted after establishment year if available.

Fertilization: No fertilizer has been applied to planting area.

Weed Control: No herbicide has been applied to any plot during year of establishment or in succeeding years. Weeds were controlled by clean cultivating between rows, within row, and in fallow areas. Four to six tillage operations were performed each year in the months of May through August. A minimum of hand hoeing was done to control weeds in rows.

Pest Control: No animal repellent or insecticide was applied in 1978. In the fall 1979, an animal repellent, Arasan 50, was sprayed on fruit trees to discourage rodent damage. Browsing by deer and rabbits is not a serious problem.

1980-1981: On November 6, 1980, and October 29, 1981, Arasan 50 was applied to the trunks and lower limbs of fruit trees to deter rodents from damaging bark and cambium. Conifers also received this spray treatment to discourage animal browse. No insecticides were applied.

1982-2010: No animal repellents or insecticides have been applied.

Irrigation: Each year, newly planted materials were watered with a portable tank. No water was added following year of establishment. During the drought years of 1988-1991, the trees were watered in the summer by station personnel.

Crop Residue Management: During 1990 and 1991, a cover crop was maintained to prevent soil erosion.

Silvicultural Practices: Extensive pruning was done in 1979-1980 to reshape trees damaged by animals. Dead trees and broken branches were cut and removed each year for sanitation. In 1988, some Russian olive accessions were treated with Tordon, using a hypo-hatchet, with unsuccessful results. In 1989, those treated accessions were cut down, but resprouted. These trees were removed by tractor in 1993. In June 2001, a front end loader was used to remove poorly performing accessions. Because of damage caused by a snowstorm in October 2005, considerable pruning was done on the trees, both in the fall and in the spring of 2006. The most damage at the site occurred in the southeast corner where the hackberry trees are planted. A number of the hybrid poplars have started to die. Trees have been cut, but stumps still remain. In 2008, many of the declining and dead poplars were removed.

Evaluations and Measurements

Previous years: Records of planting date, survival, vigor, canopy width, height, cold hardiness, animal damage, insect damage, disease symptoms, and unusual or outstanding features have been maintained since 1978 and are listed in Table DI-2. Plant performance data is recorded during the growing season for the first three years. After the third year, data is gathered according to a specific schedule. Select data appears in this report. Annual summary reports have been prepared since 2006 and can be requested from the PMC.

Results

Plant Performance: Currently, 93 accessions of 66 species are under evaluation. This site is fairly well maintained by the Dickinson Experiment Station. Very little weed competition has occurred within row. A favorable microclimate is provided by surrounding shelterbelts. This undoubtedly reduces exposure to extreme temperatures and winds and desiccation and winter injury. The drought years of 1988 and 1989 severely hampered establishment and performance. With the continued dry weather in 1990 and 1991, much of the original windbreak of spruce planted on the border died out. A number of planted accessions also died. After the drought, precipitation was above normal for several years. The soils at the plot are a Parshall fine sandy loam, which is in Windbreak Suitability Group (WSG) 5. The white poplar seems to be drought-resistant. Also, the closely related quaking aspen

seems to be doing better than the hybrid poplars. Other trees that are growing well on this fine sandy loam are many of the conifers, especially the Siberian larch and ponderosa pine. The following accessions exhibit potential for further evaluation and use:

<u>Accession Number</u>	<u>Genus/Species Origin/Source</u>	<u>Plot Location</u>
ND-1765 9005980	Siberian larch <i>Larix sibirica</i> USDA, FS, Shelterbelt Lab., Bottineau, ND	1B/03/1-10
ND-1873 9005648	Amur maple <i>Acer ginnala</i> Lincoln-Oakes Nursery, Bismarck, ND	3/09/1-5
SD-156 9005890	green ash <i>Fraxinus pennsylvanica</i> Deuel Co., Clear Lake, SD	4/01/1-5
ND-1879 9011850 PI-503531	honeylocust <i>Gleditsia triacanthos</i> ARS Field Station, Woodward, OK	4/04/1-5
SD-75 9005713	hackberry <i>Celtis occidentalis</i> Potter Co., SD	4/9/1-10
9069090	quaking aspen <i>Populus tremuloides</i> Lee Nursery, Fertile, MN	1A/5/6-10
9069168	Siberian larch <i>Larix sibirica</i> Altai Region, Russia	1A/09/6-10
9057413	Ponderosa pine <i>Pinus ponderosa</i> Glendive, MT NDFS	1B/05/1-5
ND-3803	white poplar <i>Populus alba</i> USDA, NRCS, PMC, Bismarck, ND	1B/07/6-10
9063148	corktree <i>Phellodendron sachalinense</i> Clay Co., MN	1B/09/1-5
9076737	black cherry <i>Prunus serotina</i> Apple Valley OCEP, ND Lincoln-Oakes Nursery, Bismarck, ND	II/07/1-5

Figure DI-1. Dickinson Off Center Evaluation Planting plot map

	Block 1A		Block 1B		Block 2		Block 3			Block 4		
Row 1	'West Bend' bur oak		ND-1729 Siberian larch		ND-313 red tatarian honeysuckle	ND-1730 red tatarian honeysuckle	'Midwest' Manchurian crabapple		'Red Splendor' crabapple	SD-156 green ash	ND-1734 green ash	
Row 2	9082885 aspen	9082619 green ash	SL-383-T Siberian larch		9082684 smooth sumac	9008183 Sheridan source chokecherry	ND-1731 Siberian crabapple		'McDermand' Ussurian pear	'Cardan' green ash	ND-1759 green ash	
Row 3	14392 Walker poplar	Canam Walker poplar	ND-1765 Siberian larch		ND-26 honeysuckle/ ND-452 honeysuckle	ND-170 cotoneaster	'Freedom' honey-suckle	9063143 red tatarian honey-suckle	Survivor false indigo	'Arnolds Red' honey-suckle	ND-647 black ash	ND-1432 Ohio buckeye
Row 4	ND-3796 white poplar	Raverdeau poplar	ND-1763 ponderosa pine	ND-1565 bristlecone pine	9082711 winterberry euonymus	'Regal' Russian almond	'Konza' aromatic sumac	'Scarlet' Mongolian cherry		'Legacy' late lilac	ND-1879 honeylocust	
Row 5	9082640 Gambel oak	9069090 quaking aspen	9057413 ponderosa pine	9069169 Siberian pine	ND-11 amur honeysuckle	'Centennial' cotoneaster	'Sakakawea' silver buffaloberry		'Magenta' crabapple		9063116 black ash	
Row 6	9087732 bur oak	Assiniboine poplar	9069172 Scots pine	9092231 lodgepole pine	9057406 rugosa rose	9082638 western blue elderberry	9076726 tatarian maple		9091969 Russian peashrub	9063115 green ash	9076724 Russian olive	
Row 7	9063141 eastern cottonwood	9082739 ironwood		ND-3803 white poplar	9076737 black cherry	'McKenzie' chokeberry	9082891 common ninebark		9082653 skunkbush sumac	Prairie Harvest hackberry	9069166 Russian olive	
Row 8	Hunter ponderosa pine	Bridger- Select juniper	9091967 pin cherry	9082687 black currant	9063142 Japanese cherry	9082713 Siberian peach	'Prairie Red' plum		ND-629 amur maple		'Oahe' hackberry	
Row 9	9069164 Scots pine	9069168 Siberian larch	9063148 corktree	ND-21 nannyberry	'Homestead' Arnold hawthorn		ND-1873 amur maple		ND-686 Pekin lilac		SD-75 hackberry	
Row 10	9082641 pinyon pine	9082889 mugo pine	9069081 littleleaf linden	9063126 Japanese elm	mayday/ common juniper	salt tree/ bittersweet	9069129 amur chokecherry				9057410 hackberry	
	Block 1A		Block 1B		Block 2		Block 3			Block 4		

updated 05/10

Table No. DI-1: 2010 Weather Summary - Official Station - Dickinson, North Dakota					
Month	Mean Temperature		Precipitation (inches)		
	(degrees Fahrenheit)		Actual		Deviation from Normal
	2010	Normal*	2010	Normal*	2010
January	12.8	12.0	0.55	0.35	0.20
February	11.2	18.9	0.35	0.37	-0.02
March	30.0	28.7	0.52	0.67	-0.15
April	44.3	41.3	1.04	1.63	-0.59
May	49.7	53.4	3.17	2.24	0.93
June	61.7	62.4	3.86	3.57	0.29
July	67.4	68.1	3.83	2.20	1.63
August	68.5	67.3	0.77	1.65	-0.88
September	54.4	55.4	3.05	1.62	1.43
October	47.7	43.3	0.28	1.31	-1.03
November	26.7	27.3	0.93	0.63	0.30
December	11.1	16.2	0.59	0.37	0.22
Annual	40.5	41.2	18.94	16.61	2.33
* National Climate Data Center 1971-2000 Monthly Normals					
		2010			
	Last Frost (28 degrees)	10-May			
	First Frost (28 degrees)	13-Oct			
	Frost Free Period	155 days			

Key to Table DI-2. 38I316K Field Evaluation of Woody Plant Materials – Dickinson, North Dakota

PLOT LOCATION = plot location of the plant material within the evaluation

ACCESSION NUMBER = any accession number, PI number or cultivar name assigned to the plant material

PLANT SYMBOL = plant symbol of the genus and species (asterisk indicates the symbol is not official)

GENUS/SPECIES = common name and scientific name of the plant material

ORIGIN/SOURCE = origin and/or source of the plant material

TRANS DATE = month and day the plant material was transplanted at the evaluation site

YR PLT = year the plant materials were transplanted at the evaluation site

YR REC = year of record

MATL PLTD = type of material planted, PLBR = bareroot, CONT = containerized

NO PLTS = number of plants planted in the plot

NO SRV = number of plants surviving

PCT SRV = percent of plants surviving

VI = plant vigor (1=excellent, 3=good, 5=fair, 7=poor, 9=very poor)

CAN COV (ft) = canopy cover measured in feet

PLT HT (ft) = plant height measured in feet

Table DI-2.

Project No.: 38I316K Field Evaluation of Woody Plant Materials, Dickinson, North Dakota

Year of Record: 2010

PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		PLT <u>HT</u>	<u>REMARKS</u>
											<u>VI</u>	<u>(ft)</u>		
1A/01/1-5	9094337	QUMA	bur oak <i>Quercus macrocarpa</i> Big Sioux Nursery, Watertown, SD	12-May	10	10	PLBR	5	5	100	3	0.8	2.2	
IA/02/1-5	9082885	POTR5	aspen <i>Populus tremuloides</i> NDFS Nursery, Towner, ND	11-May	04			5	5	100	4	0.8	1.9	browsed off regrowing
					05				3	60	3	2.1	3.5	
					06				5	100	4	2.0	2.7	
					08				3	60	4	2.0	2.5	
					10				3	60	4	3.3	3.9	
1A/02/6-10	9082619	FRPE	green ash <i>Fraxinus pennsylvanica</i> Jordan, MT Valley Nursery, Helena, MT	16-May	02		CONT	5	5	100	5	0.5	0.8	3,5 browsed by rabbit
					03				3	60	4	0.5	1.3	
					04				5	100	3	0.9	2.4	
					06				5	100	3	2.1	4.3	
					08				5	100	4	2.7	5.6	
IA/03/1-5	'Manitou' 9058874 14392	POPUL	poplar <i>Populus</i> USDA, ARS, Mandan, ND Lincoln-Oakes Nursery, Bismarck, ND	9-May	90		PLBR	5	5	100	2	1.7	3.0	
					91				5	100	4	2.5	4.1	
					92				5	100	4	1.6	3.2	
					94				5	100	2	9.5	16.2	
					96				5	100	3	11.7	24.6	anthracnose on leaves,
					99				5	100	3	12.2	35.2	leaves dropping on all trees
					04				5	100	5	11.8	24.6	
					09									mostly all dead
					10				2	40	3	15.5	27.4	
IA/04/1-5	9030611 ND-3796	POAL7	white poplar <i>Populus alba</i> Turner Co., SD USDA, NRCS, PMC, Bismarck, ND	15-May	92		CONT(P)	5	4	80	4	1.6	1.6	
					93				5	100	2	3.8	3.7	
					94				4	80	3	6.3	5.9	
					96				4	80	6	8.7	7.7	dieback on all trees
					98				4	80	3	14.4	13.3	
					02				4	80	7	17.0	13.5	dieback from freezing on all
					06				4	80		16.0	15.2	

Project No.: 381316K Field Evaluation of Woody Plant Materials, Dickinson, North Dakota

Year of Record: 2010

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS YR	YR	MATL	NO	NO	PCT	CAN	PLT			
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
IA/05/1-5	9082640	QUGA	Gambel oak	13-May	99	CONT	5	5	100	3	0.8	1.6		
			<i>Quercus gambelii</i>		00			3	60	4	0.9	1.2		
			Lincoln-Oakes Nursery, Bismarck, ND		01			3	60	3	2.1	2.3		
					03			3	60	3	0.9	1.9	browsed	
					05			3	60	5	1.2	2.0		
					08			2	40	4	1.8	3.4		
IA/05/6-10	9069090	POTR5	quaking aspen	15-May	93	PLBR	5	4	80	5	0.8	1.7		
			<i>Populus tremuloides</i>		94			5	100	3	1.7	4.1		
			Lee Nursery, Fertile, MN		95			5	100	3	3.4	6.2		
					97			5	100	2	5.8	9.9		
					99			5	100	3	8.8	17.3	very colorful fall foliage	
					02			5	100	1	12.5	22.6	almost white bark on 5	
					07			5	100	2	15.5	25.8	slight dieback 2,5	
IA/6/1-5	9087732	QUMA2	bur oak	6-May	09	PLBR	5	5	100	4	1.6	2.5		
			<i>Quercus macrocarpa</i>		10			4	80	5	1.3	2.1		
			USDA, NRCS, PMC, Bridger, MT											
IA/06/6-10	'Assiniboine' 9063147	POPUL	hybrid poplar	10-May	93	PLBR	5	5	100	4	0.5	1.8		
			<i>Populus</i>		94			5	100	3	3.7	6.1		
			PFRA, Indianhead, Saskatchewan, Canada		95			5	100	3	7.9	11.4		
					97			5	100	4	11.7	17.1		
					99			5	100	3	11.5	27.8		
					02			5	100	3	14.0	31.4	leaf disease on all	
					07			5	100	5	11.3	25.2	dead branches on 1	
IA/07/1-5	9063141	PODE3	eastern cottonwood	10-May	93	PLBR	5	5	100	3	1.6	3.4		
			<i>Populus deltoides</i>		94			5	100	2	5.6	9.0		
			Lincoln-Oakes Nursery, Bismarck, ND		95			5	100	3	8.1	13.7	severe leaf rust	
					97			5	100	2	15.7	22.4		
					99			5	100	2	13.5	31.8		
					02			5	100	2	18.0	37.4	2,3,4,5 have some leaf disease	
					07			5	100	4	17.5	39.0		

Project No.: 381316K Field Evaluation of Woody Plant Materials, Dickinson, North Dakota

Year of Record: 2010

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS YR	YR	MATL	NO	NO	PCT	CAN	PLT			
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
1A/07/6-10	9082739	OSVI	ironwood	8-May	08			5	1	20	8	0.5	1.3	
			<i>Ostrya virginiana</i>		09				1	20	4	0.8	2.0	
			Sertoma Park, Bismarck, ND		10				3	60	5	0.5	1.3	
			USDA, NRCS, PMC, Bismarck, ND											
IA/08/1-5	'Hunter Germplasm' 9081843	PIPOS	ponderosa pine	17-May	05			5	5	100	4	0.9	1.3	
			<i>Pinus ponderosa</i> var. <i>scopulorum</i>		06				5	100	3	1.1	1.8	
			USDA, NRCS, Bridger, MT		07				5	100	4	1.1	1.8	
					09				4	80	3	2.1	2.7	
1A/08/6-10	'Bridger-Select' 9078631	JUSC2	Rocky Mountain juniper	17-May	05			5	5	100	5	0.7	1.0	one mowed off
			<i>Juniperus scopulorum</i>		06				5	100	4	1.0	1.6	
			Bridger PMC, MT		07				4	80	3	1.1	1.9	
					09				4	80		2.1	2.8	
IA/09/1-5	9069164	PISY	Scots pine	4-May	98	CONT		5	4	80	4	0.8	1.2	
			<i>Pinus sylvestris</i> var. <i>mongolica</i>		99				4	80	4	1.0	1.5	
			Heilongjiang Province, China		00				4	80	3	1.6	2.0	
			USDA, NRCS, PMC, Bismarck, ND		02				4	80	3	3.0	4.0	
					04				5	100	3	4.2	5.7	
					07				5	100	3	7.5	10.4	
IA/09/6-10	9069168	LASI3	Siberian larch	4-May	98	CONT		5	4	80	4	0.6	1.3	
			<i>Larix sibirica</i>		99				5	100	3	1.0	1.8	
			Altai region, Russia		00				1	20	2	1.4	2.8	
			USDA, NRCS, PMC, Bismarck, ND		02				1	20	1	3.0	6.5	
					04				1	20	1	4.5	9.0	
					07				1	20	2	8.0	10.2	
IA/10/6-10	9082889	PIMU80	Mugo pine	11-May	04			5	1	20	3	0.8	1.3	
			<i>Pinus mugo</i>		05				2	40	6	0.8	0.7	
			Big Sioux Nursery, Watertown SD		06				3	60	4	1.2	1.0	
					08				2	40	4	1.9	1.5	
					10				2	40	4	3.1	2.2	

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PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS YR	YR	MATL	NO	NO	PCT	CAN	PLT			
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
IB/01/1-10	ND-1729 9005979	LASI3	Siberian larch	16-May	78	PLBR	10	9	90	3	0.7	2.0		
			<i>Larix sibirica</i>		79		10	100	4	1.1	1.4			
			NDFS State Nursery, Towner, ND		80		10	100	4	1.1	1.8			
					82		8	80	8	1.0	1.5			
					83		6	60	7	1.1	2.4	1 mowed off, moderate rodent damage		
					84		6	60	4	1.3	3.0			
					87		6	60	6	3.0	6.5			
					92		5	50	4	7.7	11.4			
					97		5	50	2	13.1	17.9			
					02		5	50	2	17.5	25.8			
	07		5	50	4	16.0	26.2							
IB/02/1-10	SL-383-T Pallet No. 2392 9005976	LASI3	Siberian larch	17-May	78	PLBR	10	10	100	3	0.6	2.2		
			<i>Larix sibirica</i>		79		10	100		0.8	1.6			
			Denbigh Exp. Forest		80		10	100	4	1.4	2.0			
			USDA, FS, Shelterbelt Lab.,		82		9	90	6	1.5	2.3			
			Bottineau, ND		83		9	90	6	2.0	3.9	1 mowed off, moderate rodent damage		
					84		8	80	2	2.6	5.6			
					87		8	80	2	5.9	10.0			
					92		8	80	8	9.9	16.4			
					97		8	80	1	16.2	23.3			
					02		8	80	2	19.0	32.0			
	07		8	80	3	17.0	31.3							
IB/03/1-10	ND-1765 9005980	LASI3	Siberian larch	17-May	78	PLBR	10	10	100	3	0.6	1.4		
			<i>Larix sibirica</i>		79		10	100		1.1	1.6			
			USDA, FS, Shelterbelt Lab.,		80		10	100	4	1.8	2.7			
			Bottineau, ND		82		10	100	5	2.1	4.0			
					83		10	100	5	2.6	4.9	moderate rodent damage, best accession of larch		
					84		10	100	4	3.6	6.1			
					87		9	90	2	7.0	11.0			
					92		9	90	2	10.4	17.5			
					97		9	90	2	15.6	24.2			
					02		9	90	2	22.0	32.0			
	07		9	90	3	21.0	30.2	dense canopy						

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IB/04/1-5	ND-1763 9006043	PIPO	ponderosa pine	16-May 78	78	CONT		5	5	100	1	0.5	1.7	
			<i>Pinus ponderosa</i>		79			4	80		0.5	1.1		
			757-5 Todd Co., SD		80			5	100	4	1.5	2.0		
			USDA, FS, Shelterbelt Lab.,		82			4	80	7	2.4	4.4		
			Bottineau, ND		83			4	80	5	2.9	3.6	animal damage	
					84			4	80	3	3.8	4.9		
					87			3	60	3	5.2	7.5		
					92			3	60	3	9.1	14.0		
					97			3	60	1	15.4	21.7		
					02			3	60	3	21.0	33.0		
	07			3	60		21.0	34.2						
IB/04/6-10	ND-1565 9006036	PIAR	bristle cone pine	16-May 78	78	CONT		5	5	100	3	0.5	0.6	
			<i>Pinus aristata</i>		79			5	100		0.7	0.6		
			USDA, FS, Shelterbelt Lab.,		80			5	100	5	1.0	0.8		
			Bottineau, ND		82			1	20	5	2.1	3.0		
					83			4	80	8	1.0	0.8	mower damage on plt 3	
					84			2	40	3	1.9	1.8		
					87			2	40	6	2.3	2.0		
					92			1	20	5	5.4	3.9		
					97			1	20	1	8.2	7.7		
					02			1	20	3	16.5	10.5		
	07			1	20	3	11.0	13.5						
IB/05/1-5	9057413	PIPO	ponderosa pine	11-May 88	88	CONT		5	2	40	4	0.3	1.1	
			<i>Pinus ponderosa</i>		89			2	40	4	0.7	1.4		
			Glendive, MT		90			4	80	4	0.8	1.5		
			NDFS		92			4	80	4	1.2	2.2		
					94			4	80	4	3.0	4.2		
					97			4	80	2	7.2	9.3		
					02			4	80	2	12.5	20.9		
	07			4	80	2	14.3	26.9						

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IB/05/6-10	9069169	PISI3	Siberian pine <i>Pinus sibirica</i> Altai USDA, NRCS, PMC, Bismarck, ND	14-May	03	03		5	5	100				
						04			5	100	3	0.6	0.8	
						05			5	100	4	1.0	0.9	
						07			5	100	3	0.8	1.0	
						09			2	40	4	1.5	1.1	
IB/06/1-5	9069172	PISY	Scots pine <i>Pinus sylvestris</i> Altai region, Russia USDA, NRCS, PMC, Bismarck, ND	6-May	97	CONT		5	5	100	2	0.5	1.2	
						98			4	80	3	1.2	1.7	
						99			5	100	1	1.3	2.6	
						01			5	100	2	2.5	4.9	
						03			5	100	3	4.2	7.7	
						06			5	100	3	6.4	12.4	
IB/6/6-10	9092231 14070 (ARS)	PICOL	lodgepole pine <i>Pinus contorta</i> var. <i>latifolia</i> Routt National Forest, Salida, CO Towner State Nursery, Towner, ND	6-May	09	09		5	5	100	4	0.5	1.0	
						10			5	100	3	1.2	1.6	
IB/07/6-10	ND-3803 9030612	POAL7	white poplar <i>Populus alba</i> USDA, PMC, Bismarck, ND	24-May	94	CONT		5	5	100	3	2.0	3.1	
						95			4	80	2	6.2	6.5	
						96			4	80	5	4.4	4.4	
						98			4	80	3	11.2	11.1	
						00			4	80	2	14.0	17.3	
						03			4	80	2	19.4	21.1	
						08			4	80	3	31.0	27.3	suckering
IB/08/1-5	9091967	PRPE2	pin cherry <i>Prunus pensylvanica</i> Upper Red Lake, MN Big Sioux Nursery, Watertown, SD	6-May	09	09		5	5	100	3	0.6	1.9	
						10			4	80	5	0.9	1.5	
IB/08/6-10	9082687	RIAM2	black currant <i>Ribes americanum</i> Big Sioux Nursery, Watertown, SD	9-May	07	07		5	0	0				
						08			2	40	6	0.4	1.8	
						09			4	80	3	2.0	2.1	

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IB/09/1-5	9063148	PHSA80	corktree <i>Phellodendron sachalinense</i> Clay Co., MN	4-May	95	CONT		5	5	100	4	0.7	1.3	
					96				4	80	3	1.7	2.2	
					97				4	80	3	2.6	2.9	
					99				3	60	2	5.2	5.7	some hail damage
					01				3	60	3	10.8	8.3	
					05				3	60	2	14.8	11.3	
IB/09/6-10	ND-21 9034900	VILE	nannyberry <i>Viburnum lentago</i> USDA, ARS, Mandan, ND USDA, NRCS, PMC, Bismarck, ND	7-May	86	PLBR		5	5	100	3	0.5	1.5	
					87				5	100	3	0.7	1.9	
					88				5	100	3	1.5	2.7	
					90				5	100	3	2.7	3.8	
					92				5	100	3	4.2	4.7	
					95				5	100	2	6.5	7.4	fruit on 1,2,4,5
					00				5	100	5	9.7	10.3	
					05				5	100	4	12.0	11.2	leaves quite dry on 1
IB/10/1-5	9069081	TICO2	littleleaf linden <i>Tilia cordata</i> Lee Nursery, Fertile, MN	10-May	93	CONT(P)		5	5	100	5	0.7	1.3	weedy
					94				5	100	4	0.6	1.2	
					95				5	100	4	2.1	2.8	
					97				5	100	4	4.0	4.0	
					99				5	100	3	6.9	7.4	
					02				5	100	3	10.5	11.6	
					07				5	100	4	13.0	16.0	
IB/10/6-10	9063126	ULDAJ	Japanese elm <i>Ulmus davidiana</i> var. <i>japonica</i> Manchuria PFRA, Indianhead, Saskatchewan, Canada	15-May	92	CONT(P)		5	3	60	4	1.7	1.7	
					94				3	60	3	4.2	4.5	
					96				5	100	4	5.9	6.3	5 is sucker
					98				4	80	5	12.0	10.7	dieback on 2,3,4
					01				4	80	4	14.8	11.7	all have dead branches
					06				4	80	4	16.0	12.9	dieback on 3,4; severe on 3

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II/01/1-10	ND-313	LOTA	red tatarian honeysuckle	17-May	78	PLBR	10	9	90	1	1.5	1.6		
	9005996		<i>Lonicera tatarica sibirica</i>		79			9	90		2.0	2.4		
	PI-477999		USDA, ARS, Cheyenne, WY		80			10	100	3	3.2	2.4		
			USDA, NRCS, PMC, Bismarck, ND		82			10	100	4	5.3	4.5		
					83			10	100	3	5.9	5.4	good fruit	
					84			10	100	4	7.4	5.5	moderate-severe insect	
					87			10	100	3	5.6	6.7	defoliation, honeysuckle aphid	
					92			10	100	5	6.8	7.3		
					97			10	100	5	15.3	9.0		
					02			10	100	3	15.5	11.6		
					07			10	100	7	14.0	10.5		
II/01/11-20	ND-1730	LOTA	red tatarian honeysuckle	17-May	78	PLBR	10	10	100	1	1.6	1.7		
	9005994		<i>Lonicera tatarica sibirica</i>		79			10	100		2.2	2.8		
			Lincoln-Oakes Nursery,		80			10	100	1	3.4	3.0		
			Bismarck, ND		82			10	100	4	5.9	5.2		
					83			10	100	3	6.7	6.5	good vigor	
					84			10	100	5	7.7	6.6	slight insect defoliation	
					87			10	100	3	6.5	7.2	good fruit production,	
					92			9	90	6	6.4	7.1	snow damage, aphid damage	
					97			9	90	5	15.3	8.2		
					02			10	100	3	15.5	11.5		
					07			10	100	8	11.5	9.5		
II/02/1-5	9082684	RHGL	smooth sumac	14-May	03			5						weedy, poor survival
			<i>Rhus glabra</i>		04			5	100	3	3.0	2.6		
			Lincoln-Oakes Nursery, Bismarck, ND		05			5	100	4	4.8	3.6		
					07			5	100	2	6.0	6.0		
					09			5	100	2	7.0	6.8		
II/02/6-10	9008183	PRVI	common chokecherry	17-May	05			5	4	100	4	1.0	2.3	
			<i>Prunus virginiana</i>		06				4	100	4	2.2	3.2	
			Lincoln-Oakes Nursery, Bismarck ND		07				4	100	3	2.4	3.4	
					09				4	80	3	3.6	5.0	

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II/03/1-10	ND-26	LONIC	honeysuckle	2-May	79	79	PLBR	10	10	100		1.1	1.4	
	9011852		<i>Lonicera</i>			80			10	100	5	2.0	1.7	
			USDA, ARS, Mandan, ND			81			10	100		2.6	2.9	
						83			10	100	4	4.5	4.8	leaf spot
						84			10	100	4	4.9	5.4	witches broom on plts 3,5,8
						88			10	100	4	7.5	7.0	moderate insect defoliation,
						93			10	100	5	10.5	9.0	grasshoppers, aphid damage
						98			10	100	4	15.4	10.5	aphid damage on 3
						03			10	100	4	21.0	11.8	
						08			10	100	5	18.0	11.0	
II/03/11-15	ND-452	LOXY	honeysuckle	2-May	79	79	PLBR	5	5	100		1.2	1.3	
	9019978		<i>Lonicera xylosteum mollis</i>			80			5	100	3	2.3	1.5	
			USDA, ARS, Cheyenne, WY			81			5	100		3.2	2.9	
			USDA, NRCS, PMC, Bismarck, ND			83			5	100	4	5.5	5.5	witches broom on 1,2,3
						84			5	100	3	6.5	5.5	slight leaf spot, leaf
						88			5	100	5	7.5	6.7	blight, aphid damage
						93			5	100	6	9.3	7.6	
						98			5	100	6	11.5	8.4	severe aphid damage on 1,2
						08			3	60	5	11.5	9.0	
II/03/16-20	ND-170	COIN16	cotoneaster	9-May	90	90	CONT	5						
	9005728		<i>Cotoneaster integerrimus</i>			91			4	80	6	0.8	1.5	
			USDA, NRCS, PMC, Bismarck, ND			92			4	80	6	1.5	1.4	
						94			4	80	4	4.1	3.0	
						96			4	80	4	5.5	3.5	
						99			4	80	4	5.1	3.5	
						04			4	80	5	6.5	4.5	fireblight on 2, 3
						09			4	80	3	5.5	4.5	
II/04/1-5	9082711	EUBU6	winterberry euonymus	16-May	02	02	PLBR	5	4	80	4	1.0	1.7	
			<i>Euonymus bungeanus</i>			03			4	80	5	0.9	2.0	
			Lincoln-Oakes Nursery, Bismarck, ND			04			4	80	5	0.4	0.9	cut off #4
						06			4	80	5	0.3	1.4	2 chewed off, 3 heavily browsed
						08			3	60	3	1.8	2.4	

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II/04/11-20	'Regal'	PRTE5	Russian almond	8-May	80	PLBR		10	10	100	5	0.8	2.2	
	ND-283		<i>Prunus tenella</i>		81				7	70		0.9	1.4	
	9006079		ND Game & Fish Dept.		82				10	100	4	1.8	2.3	
	PI-540442		USDA, NRCS, PMC, Bismarck, ND		83				8	80	4	3.9	3.5	few pests
					84				10	100	4	3.8	3.7	
					86				9	90	4	5.2	4.5	
					88				9	90	3	6.0	4.7	
					89				9	90	4	4.2	4.8	
					94				9	90	4	6.6	4.3	
					99				5		3	13.1	6.6	
					04				10	100	3	13.0	7.0	
					09				10	100	3	16.0	5.5	good seed crop
II/05/1-10	ND-11	LOMA6	amur honeysuckle	7-May	81	CONT		10	10	100		0.7	0.6	
	9005993		<i>Lonicera maackii</i>		82				10	100	4	1.4	1.4	
	PI-477998		Res. Sta., Morden, MB, Canada		83				6	60	6	1.6	1.8	slight insect
					84				10	100	4	2.1	1.8	defoliation (grasshoppers)
					86				10	100	4	4.2	4.6	
					87				10	100	3	8.5	5.6	
					88				10	100	4	7.4	5.6	
					90				10	100	4	5.7	5.7	
					95				10	100	4	7.1	8.5	
					00				10	100	4	8.4	10.0	
					05				10	100	2	16.1	12.2	
					10				10	100	3	16.0	13.0	
II/05/11-20	'Centennial'	COIN16	cotoneaster	8-May	85	PLBR		10						no data
	ND-177		<i>Cotoneaster integerrimus</i>		86				8	80	4	2.3	2.2	
	9005729		Lincoln-Oakes Nursery, Bismarck, ND		87				7	70	3	4.0	3.3	
	PI-113095				88				10	100	4	3.2	3.0	
					89				8	80	4	4.5	3.5	
					91				7	70	5	5.3	4.3	
					94				7	70	4	7.5	7.6	
					99				7	70	4	12.5	10.2	
					04				7	70	5	12.0	10.5	fireblight on all 5
					09				7	70	3	12.0	10.5	

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II/06/1-5	9057406	RORU	rugosa rose <i>Rosa rugosa</i> Lincoln-Oakes Nursery, Bismarck, ND	16-May	02	CONT	5	5	100	5	1.0	1.4	
					03			3	60	3	0.8	1.0	
					04			5	100	3	1.8	1.6	
					06			5	100	4	3.2	2.4	
					08			5	100	5	2.1	1.6	
II/06/11-15	9082638	SANIC5	western blue elderberry <i>Sambucus nigra</i> ssp. <i>caerulea</i> Lincoln-Oakes Nursery, Bismarck, ND	13-May	99	CONT	5						
					00			5	100	4	1.5	2.9	
					01			5	100	3	4.9	5.5	
					03			5	100	2	7.0	6.0	
					05			5	100	4	12.7	9.0	
					08			5	100	5	9.0	9.2	
II/07/1-5	9076737	PRSE2	black cherry <i>Prunus serotina</i> Apple Valley FEP, ND Lincoln-Oakes Nursery, Bismarck, ND	6-May	97	PLBR	5	4	80	3	1.1	1.7	
					98			5	100	4	2.8	3.0	
					00			5	100	3	6.6	7.9	
					03			5	100	2	12.4	12.5	
					06			5	100	2	16.0	15.0	
II/07/6-10	'McKenzie' 323957	PHME13	black chokeberry <i>Photinia melanocarpa</i> Lincoln-Oakes Nursery, Bismarck, ND	23-May	00	PLBR	5	5	100	3	0.9	1.7	
					01			5	100	4	1.8	1.7	
					02			5	100	3	0.9	1.7	
					04			5	100	3	4.3	3.6	
					06			5	100	2	5.4	4.6	
					09			5	100	3	4.8	5.5	
II/08/1-5	9063142	PRUNU	Japanese cherry <i>Prunus</i> Bottineau FEP, ND Lincoln-Oakes Nursery, Bismarck, ND	10-May	93	PLBR	5	5	100	4	1.2	2.0	
					94			5	100	4	1.7	2.6	
					95			4	80	4	2.6	3.0	
					97			3	60	6	1.6	2.3	
					99			2	40	4	3.0	3.3	
					02			2	40	5	5.1	3.0	1,4 have some dieback
					07			2	40	4	4.8	4.9	

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<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
II/08/6-10	9082713	PRPEP2	Siberian peach <i>Prunus persica</i> var. <i>persica</i> Lincoln-Oakes Nursery, Bismarck, ND	16-May	02	PLBR	5	5	100	2	1.6	2.7		
					03			5	100	4	4.1	4.0		
					04			4	80	2	6.1	5.8		
					06			4	80	4	7.8	6.8		
					08			4	80	4	6.9	7.7		
II/09/1-10	'Homestead' ND-20 9005731 PI-503530	CRAN6	Arnold hawthorn <i>Crataegus X anomala</i> USDA, NRCS, PMC, Bismarck, ND	9-May	84	CONT	10	10	100	4	0.7	0.3		
					86			10	100	4	1.7	2.7		
					88			10	100	3	3.8	4.8		
					90			10	100	4	4.0	6.0		
					93			9	90	3	6.2	8.9		
					98			9	90	2	13.1	13.0		
					03			9	90	2	18.0	15.4		
					08			9	90	4	18.0	16.2	leaves dried up due to drought	
II/10/1-5	SD-131 9006073 PI-536048	PRPA5	mayday <i>Prunus padus</i> Brookings Co., SD USDA, NRCS, PMC, Bismarck, ND	8-May	85	PLBR	10							no data
					86			10	100	3	1.5	2.8		
					87			10	100	3	2.3	4.7		
					89			10	100	4	6.0	7.6		
					91			3	30	5	5.6	8.7		
					94			3	30	4	11.0	14.1		
					99			3	30	2	14.8	19.6		
					04			1	10	8	20.5	20.3		
					09			0	0					
II/10/2-6	ND-3742 9019593	JUCO6	common juniper <i>Juniperus communis</i>	4-May	06	CONT	5	5	100	4	1.6	1.0		
					07			4	80	5	0.8	0.7		
					08			3	60	3	1.1	0.9		
					10			4	80	4	2.5	1.3		
II/10/6-10	9057438	HABA8	Siberian salt tree <i>Halimodendron halidendron</i> PFRA, Indianhead, Saskatchewan, Canada	11-May	94	CONT	5	1	20	3	0.3	1.1		
					95			4	80	4	0.6	1.3		
					96			4	80	4	0.8	1.6	soil shallow to bedrock	
					98			5	60	5	0.9	2.0		
					03			1	20	2	1.8	3.5	many pods left from 2002	
					08			1	20	6	3.0	1.8		

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II/10/11-15	9082712	CESC	bittersweet	16-May	02	02	PLBR	5	4	80	4	0.4	1.1	
			<i>Celastrus scandens</i>			03			5	100	4	0.7	1.7	
			Lincoln-Oakes Nursery, Bismarck, ND			04			5	100	3	0.7	1.4	
						06			5	100	3	2.0	2.1	
						08			5	100	5	1.5	1.5	
III/01/1-5	'Midwest'	MAMA37	Manchurian crabapple	17-May	78	78	PLBR	5	3	60	2	0.5	2.0	
	9006003		<i>Malus mandshurica</i>			79			5	100		0.9	2.1	
	PI-478000		Echo Manchuria/Res. Sta.			80			5	100	3	1.9	2.8	
			Morden, MB, Canada			82			5	100	3	4.7	5.5	
			USDA, NRCS, PMC, Bismarck, ND			83			5	100	2	6.0	6.9	fall webworm on 1, few
						84			5	100	4	7.7	8.5	pests, good vigor,
						87			5	100	3	9.4	11.4	snow damage on 1,2,3
						92			2	40	8	6.0	7.3	
						97			2	40	3	13.8	13.9	
						02			2	40	4	15.5	14.6	
						07			2	40	8	12.0	12.9	many dead branches
III/01/6-10	'Red Splendor'	MABA	flowering crabapple	17-May	78	78	PLBR	5	5	100	2	1.6	2.2	
	9006004		<i>Malus X</i>			79			5	100		2.5	3.8	
			Lee Nursery, Fertile, MN			80			5	100	2	3.5	4.7	
						82			5	100	3	5.9	8.4	
						83			5	100	3	7.0	9.1	good fruit production, few pests
						84			5	100	3	8.6	10.9	snow damage 1,2; webworm 3,5
						87			5	100	2	10.3	12.2	
						92			5	100	6	9.3	11.2	
						97			5	100	4	13.8	14.0	
						02			5	100	4	14.5	15.6	
						07			5	100	6	13.0	14.1	

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III/02/1-5	ND-1731 9006001	MABA	Siberian crabapple	17-May 78	78	PLBR	5	4	80	2	1.9	2.2		
			<i>Malus baccata</i>		79		5	100		2.8	3.1			
			Lincoln-Oakes Nursery, Bismarck, ND		80		5	100	3	4.1	4.1			
					82		5	100	3	5.8	8.2			
					83		5	100	2	7.5	10.5	good growth & vigor,		
					84		5	100	2	10.1	10.8	few pests, fall webworm		
					87		5	100	3	10.6	13.9	on 1,4,5		
					92		5	100	6	9.2	13.7			
					97		5	100	6	13.7	14.4			
					02		5	100	5	15.5	16.8			
	07		4	80	6	12.5	16.5							
III/02/6-10	'McDermard' ND-14 9006095 PI-478004	PYUS2	Ussurian pear	17-May 78	78	PLBR	5	5	100	6	0.9	2.5		
			<i>Pyrus ussuriensis</i>		79		5	100		1.8	3.6			
			Harbin, Manchuria/Res. Sta.		80		5	100	1	3.0	4.6			
			Morden, MB, Canada		82		5	100	3	6.4	8.9			
			USDA, NRCS, PMC, Bismarck, ND		83		5	100	1	8.0	11.0	good growth & vigor		
					84		5	100	2	9.3	12.4			
					87		5	100		12.4	15.8	snow damage on 4		
					92		5	100	6	10.9	13.2			
					97		5	100	2	18.7	17.2			
					02		5	100	2	25.0	22.0			
	07		4	80	7	21.0	21.6							
III/03/1-5	'Freedom' 9057424	LOKO2	honeysuckle	9-May 90	90	PLBR	5	5	100	5	1.0	1.1		
			<i>Lonicera korolkowii</i>		91		5	100	4	1.4	1.6			
			Univ. of MN		92		5	100	3	3.3	3.1			
					94		5	100	3	6.6	6.1			
					96		5	100	3	8.5	7.8	minor dieback		
					99		5	100	2	14.1	11.2			
					04		5	100	2	17.0	12.3			
					09		5	100	2	18.5	14.0			

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III/03/6-10	9063143	LOTA	tatarian honeysuckle	10-May 93	93	PLBR	5	5	100	4	1.1	1.4	
			<i>Lonicera tatarica</i>		94			5	100	3	1.1	1.8	
			Iowa		95			5	100	4	2.2	2.8	
			Lincoln-Oakes Nursery, Bismarck, ND		97			5	100	3	3.5	4.2	
					99			5	100	4	4.3	6.1	
					02			5	100	3	6.5	6.5	
					07			5	100	5	6.0	9.3	
III/03/11-15	Survivor	AMFR	false indigo	6-May 87	87	PLBR	5	4	80		1.3	1.7	
	Germplasm		<i>Amorpha fruticosa</i>		88			5	100	5	2.8	2.1	
	9008041		USDA, NRCS, PMC, Aberdeen, ID		89			5	100	5	3.1	2.7	
					91			5	100	4	5.3	3.3	
					93			5	100	3	7.0	4.3	
					96			5	100	4	6.6	5.0	
					01			5	100	3	11.0	5.0	
					06								mostly dead, overgrown with other volunteers
III/03/16-20	'Arnolds Red'	LOTA	red tatarian honeysuckle	10-May 93	93	PLBR	5	5	100	4	0.9	1.1	
	9069080		<i>Lonicera tatarica</i>		94			5	100	4	1.3	1.9	
			Lee Nursery, Fertile, MN		95			5	100	3	2.3	3.1	
					97			5	100	3	3.6	4.7	
					99			5	100	3	4.5	6.5	
					02			5	100	4	6.5	7.0	
					07			5	100	3	6.0	8.3	
III/04/1-5	'Konza'	RHAR4	aromatic sumac	6-May 87	87	PLBR	5	4	80		1.7	2.5	
	PI-477981		<i>Rhus aromatica</i>		88			4	80	3	3.4	3.1	
			USDA, NRCS, PMC, Manhattan, KS		89			4	80	4	3.8	3.7	
					91			4	80	3	5.7	4.4	
					93			4	80	2	9.6	6.3	
					96			4	80	4	9.2	6.7	
					01			4	80	1	16.0	8.0	solid thicket
					06			5	100	3	17.0	8.0	

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III/04/6-15	'Scarlet'	PRFR2	Mongolian cherry	9-May	90	PLBR		10	9	90	3	0.6	1.6	
	PI-478003		<i>Prunus fruticosa</i>		91				9	90	5	0.8	1.3	
			USDA, NRCS, PMC, Bismarck, ND		92				9	90	4	1.3	1.7	
					94				9	90	4	2.2	2.3	
					96				8	80	4	3.1	2.6	
					99				3	30	3	5.2	3.3	
					04									original row gone, suckers on each side
III/04/16-20	'Legacy'	SYVI3	late lilac	11-May	88	PLBR		5	2	40	6	1.0	1.7	
	ND-83		<i>Syringa villosa</i>		89				2	40	6	0.4	1.1	
	9006228		USDA, NRCS, PMC, Bismarck, ND		90				5	100	5	0.7	1.1	
	PI-540443		Lincoln-Oakes Nursery, Bismarck, ND		92				3	60	4	1.9	1.9	
					94				3	60	3	4.2	4.4	
					97				3	60	3	8.1	6.9	
					02				3	60	2	11.0	10.0	
					07				3	60		11.0	9.8	
III/05/1-10	'Sakakawea'	SHAR	silver buffaloberry	9-May	90	PLBR		10	3	30	3	0.7	2.2	
	ND-10		<i>Shepherdia argentea</i>		91				4	40	4	0.5	1.9	
	PI-478005		USDA, NRCS, PMC, Bismarck, ND		92				8	80	4	0.9	1.7	
					94				8	80	3	3.0	3.7	
					96				8	80	2	5.9	7.0	
					99				8	80	3	8.4	11.3	
					04				8	80	3	13.0	11.8	
III/05/11-15	'Magenta'	MALUS	crabapple	15-May	92	PLBR		5	5	100	5	0.5	1.1	
	PI-514275		<i>Malus</i> sp.		93				4	80	3	1.6	3.0	
			USDA, NRCS, PMC, E. Lansing, MI		94				5	100	3	2.2	3.6	
					96				5	100	5	3.9	5.2	fireblight on 2,3,5; dieback on 1
					98				5	100	3	4.4	6.9	webworms on 4
					01				5	100	4	9.0	10.0	
					07				4	80	2	16.0	15.2	

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III/06/1-5	9076726	ACGI	tatarian maple <i>Acer ginnala</i> USDA, ARS, Mandan, ND	13-May 96	96	PLBR	5	5	100	3	1.0	0.9		
					97			5	100	5	2.2	1.7		
					98			5	100	4	2.8	2.0		
					00			5	100	3	3.5	2.3		
					02			5	100	4	5.5	4.0	Canada thistle 1	
					05			4	80		8.2	6.5		
					10			4	80	4	13.5	11.1		
III/06/6-10	9091969	CAFR80	Russian peashrub <i>Caragana frutex</i> Big Sioux Nursery, Watertown, SD	17-May 05	05			5	5	100	4	0.8	3.4	
					06				5	100	6	0.6	2.6	
					07				5	100	5	0.9	2.6	
					09				5	100	4	0.9	2.9	
III/7/1-5	9082891	PHOP	common ninebark <i>Physocarpus opulifolius</i> Big Sioux Nursery, Watertown, SD	12-May 10	10			5	5	100	5	0.6	1.6	
III/07/6-10	9082653	RHTR	skunkbush sumac <i>Rhus trilobata</i> Harding Co., SD USDA, NRCS, PMC, Bismarck, ND	14-May 03	03			5	5	100				
					04				5	100	3	1.4	1.4	
					05				4	80	4	2.0	1.5	
					06				5	100	3	3.4	2.0	
					07				5	100	3	3.6	2.4	
					09				4	80		7.0	3.3	
III/08/1-5	'Prairie Red' ND-1134 9047203	PRUNU	plum <i>Prunus</i> Miller, SD USDA, NRCS, PMC, Bismarck, ND	8-May 85	85	PLBR		5						no data
					86				5	100	8	0.5	1.3	
					87				3	60	4	1.9	3.0	
					89				3	60	5	3.5	4.1	
					91				2	40	4	6.6	5.7	
					94				2	40	4	8.5	7.9	
					99				2	40	3	11.5	10.0	
					04				1	10	2	17.0	11.0	
					09				2	40	3	13.0	12.0	

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III/08/6-10	ND-629 9005645 PI-477992	ACGI	amur maple <i>Acer ginnala</i> Res. Sta., Morden, MB, Canada	2-May	79	PLBR		5	5	100		1.0	1.5	
									0					
									4	80		1.3	1.9	
									4	80	3	6.0	6.0	
									4	80	4	9.9	7.5	
									4	80	4	13.0	10.8	
									3	60	5	13.1	12.0	
									3	60	3	18.4	17.4	
									3	60	3	24.5	16.4	
	3	60	5	32.0	16.2									
III/09/1-5	ND-1873 9005648	ACGI	amur maple <i>Acer ginnala</i> Lincoln-Oakes Nursery, Bismarck, ND	2-May	79	PLBR		5	5	100		1.6	2.2	
									5	100	3	2.8	3.0	
									5	100		4.2	4.3	
									5	100	2	7.2	7.4	good seed production
									5	100	3	10.0	8.8	
									5	100	4	13.2	11.7	
									5	100	4	10.0	9.9	
									5	100	3	16.1	13.4	
									5	100	3	19.9	14.6	
	5	100	4	18.0	14.5									
III/09/6-10	ND-686 9006225 PI-478008	SYPE4	pekin lilac <i>Syringa pekinensis</i> ND Game & Fish Dept.	2-May	79	PLBR		5	5	100		0.7	2.3	
									2	40	7	1.5	2.7	
									2	40		1.5	2.8	
									3	60	5	3.3	3.8	
									5	100	5	3.1	2.9	
									3	60	4	8.3	8.3	
									3	60	4	10.1	9.9	
									3	60	3	15.5	14.2	
									3	60	3	18.5	16.5	
	3	60	3	21.0	16.5									

Project No.: 381316K Field Evaluation of Woody Plant Materials, Dickinson, North Dakota

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PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT									
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>							
III/10/1-5	9069129	PRMA9	Amur chokecherry <i>Prunus maackii</i> Big Sioux Nursery, Watertown, SD	11-May	94	PLBR		5	5	100	4	0.7	2.2								
IV/01/1-5	SD-156 9005890	FRPE	green ash <i>Fraxinus pennsylvanica</i> Deuel Co., SD	17-May	78	PLBR		5	5	100	1	0.5	2.6								
IV/01/6-10	ND-1734 9005891	FRPE	green ash <i>Fraxinus pennsylvanica</i> Lincoln-Oakes Nursery, Bismarck, ND	17-May	78	PLBR		5	5	100	2	0.4	2.1								

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IV/02/1-5	'Cardan'	FRPE	green ash	17-May	78	PLBR	5	5	100	2	0.3	2.3		
	MDN-12002		<i>Fraxinus pennsylvanica</i>		79			5	100		1.7	3.4		
	9005895		Wibaux Co., MT		80			5	100	3	3.0	5.1		
	PI-469226		USDA, ARS, Mandan, ND		82			5	100	3	7.5	10.1		
					83			5	100	2	8.4	11.4	good vigor	
					84			5	100	3	9.7	13.8		
					87			5	100	3	9.5	18.1		
					92			5	100	3	10.9	22.5		
					97			5	100	3	15.1	25.1		
					07			5	100	3	20.0	33.3		
IV/02/6-10	ND-1759	FRPE	green ash	17-May	78	PLBR	5	5	100	1	0.4	2.5		
	9005893		<i>Fraxinus pennsylvanica</i>		79			5	100		1.6	4.1		
			SD-156 X MDN-12002		80			5	100	3	3.1	5.2		
			USDA, NRCS, PMC, Bismarck, ND		82			5	100	4	5.8	8.1		
					83			5	100	3	7.9	10.7	competition from	
					84			5	100	3	8.9	13.4	shelterbelt at north end	
					87			5	100	3	9.0	15.8		
					92			5	100	3	10.2	19.0		
					97			5	100	2	15.6	25.1		
					02			5	100	3	17.0	29.4		
					07			5	100		20.0	30.2		
IV/03/1-5	ND-647	FRNI	black ash	17-May	78	PLBR	5	5	100	1	0.1	0.9		
	9005887		<i>Fraxinus nigra</i>		79			5	100		0.4	1.9		
			Res. Sta., Morden, MB, Canada		80			5	100	6	1.2	2.7		
					82			5	100	4	4.1	8.0		
					83			5	100	4	4.8	10.5	heat stress	
					84			5	100	4	4.2	11.4	leaf scorch	
					87			5	100	3	5.6	18.4	sun scald	
					92			5	100	7	5.6	15.2		
					97			5	100	5	12.3	19.3		
					02			5	100	3	14.0	26.8		
					07			5	100	5	14.5	29.1		

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<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
IV/03/6-10	ND-1432 9005658	AEGL	Ohio buckeye	17-May 78	78	PLBR	5	3	60	8	0.0	0.2		
			<i>Aesculus glabra</i>		79		3	60	0.1	0.5				
			Res. Sta., Morden, MB, Canada		80		3	60	9	0.5	0.4			
					82		1	20	6	1.5	2.1			
					83		1	20	6	1.6	2.3			
					84		1	20	6	3.3	3.3			
					87		1	20	6	6.2	5.4			
					92		1	20	5	7.9	7.2			
					97		1	20		12.8	10.5			
					02		1	20	4	12.5	15.5			
	07		1	20		14.5	15.5							
IV/04/1-5	ND-1879 9011850 PI-503531	GLTR	honeylocust	8-May 80	80	PLBR-	5	1	20	9	0.3	0.5		
			<i>Gleditsia triacanthos</i>		81	CONT		2	40	0.1	0.8			
			Woodward, OK		82		5	100	4	1.4	2.2			
			USDA, ARS, Mandan, ND		83		5	100	2	2.5	3.9	good vigor		
					84		5	100	3	3.2	5.7			
					86		5	100	3	7.5	9.1			
					89		4	80	4	8.1	12.8			
					95		5	100	4	16.4	17.4			
					04		5	100	3	19.2	26.5			
					09		5	100	3	22.0	25.8			
IV/05/1-5	9063116	FRNI	black ash	11-May 94	94	CONT	5	5	100	4	0.3	1.2		
			<i>Fraxinus nigra</i>		95		5	100	4	0.9	1.4			
			Itasca State Park, MN		96		4	80	4	1.1	1.7	broken leader on 4		
					98		4	80	3	2.0	3.6			
					00		4	80	4	3.2	6.5			
					03		3	60	4	5.3	10.2			
					08		3	60	4	4.8	12.6			

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<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
IV/06/1-5	9063115	FRPE	green ash <i>Fraxinus pennsylvanica</i> Itasca State Park, MN	11-May 94	94	CONT		5	5	100	3	0.7	1.7	
					95				5	100	3	1.5	3.3	
					96				5	100	2	2.5	4.5	
					98				5	100	2	7.1	9.7	
					00				5	100	3	8.9	13.4	
					03				5	100		13.6	19.4	
					08				5	100	3	14.5	24.4	
IV/06/6-10	9076724	ELAN	Russian olive <i>Elaeagnus angustifolia</i> USDA, ARS, Mandan, ND	13-May 96	96	PLBR		5	4	80	3	2.2	2.3	
					97				4	80	3	3.3	3.4	
					98				4	80	3	5.4	5.5	
					00				4	80	4	7.9	8.4	
					02				4	80	5	11.0	9.5	needs a new stake
					05				4	80	4	11.7	12.5	
					10				4	80	3	15.5	14.8	
IV/07/1-5	Prairie Harvest Germplasm 9034956	CEOC	hackberry <i>Celtis occidentalis</i> Polk County, MN	3-May 10	10	CONT		5	5	100	6	0.3	1.0	all heavily browsed
IV/07/6-10	9069166	ELAN	Russian olive <i>Elaeagnus angustifolia</i> USDA, ARS, Mandan, ND	13-May 96	96	CONT(S)		5	1	20	5	0.5	0.7	1-4 destroyed by cultivation
					97				4	80	3	1.0	1.3	
					98				2	40	6	1.4	3.0	
					00				2	40	5	2.3	4.1	
					02				2	40	6	4.8	7.5	
					05				2	40	5	6.6	8.2	
					10				2	40	3	6.1	12.1	

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IV/08/1-10	'Oahe'	CEOC	hackberry	8-May	80	PLBR		10	10	100		0.5	2.0	
	MDN-12003		<i>Celtis occidentalis</i>		81				9	90		0.1	0.5	
	9005725		USDA, ARS, Mandan, ND		82				8	80	6	1.3	1.6	
	PI-476982				83				8	80	6	1.9	3.0	
					84				7	70	4	2.9	4.6	
					86				4	40	3	9.2	10.3	
					89				5	50	4	8.7	11.7	
					95				5	50	4	14.3	19.0	
					99				5	50	5	14.0	20.3	
					04				5	50	4	16.8	25.4	
					09				5	50	5	17.5	23.5	
IV/09/1-10	SD-75	CEOC	hackberry	7-May	81	PLBR		10	10	100		0.1	1.2	
	9005713		<i>Celtis occidentalis</i>		82				7	70	6	0.9	1.4	
			Potter Co., SD		83				6	60	3	2.9	3.0	
					84				7	70	5	3.5	4.1	
					85				6	60	4	6.7	5.9	
					87				7	70	4	8.1	10.4	
					90				7	70	4	9.2	12.3	
					95				7	70	3	12.7	19.7	
					00				7	70	3	14.4	23.1	
					05				7	70	3	22.2	26.0	
					10				7	70	4	22.0	24.7	dead top 5,9
IV/10/6-10	9057410	CEOC	hackberry	11-May	88	CONT		5	2	40	8	0.2	0.2	
			<i>Celtis occidentalis</i>		89				1	20	8	0.2	0.5	
			Bottineau Co., ND		90				3	60	8	0.2	0.7	
			NDFS		92				4	80	7	0.5	0.5	
					94				2	40	6	1.0	2.4	
					97				2	40	4	3.5	5.6	
					02				2	40	6	4.0	6.8	
					07				2	40	5	5.0	10.3	



2010 Report Off-Center Evaluation Planting of Woody Plant Materials Dickinson, North Dakota

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INTRODUCTION

The Bismarck Plant Materials Center (PMC) was established in 1954 as part of the Soil Conservation Service, now Natural Resources Conservation Service (NRCS). A principal task of the PMC has always been tree improvement. There is a need to evaluate how different trees and shrubs will perform in various conservation plantings, under diverse soils and climate conditions. The PMC is currently testing woody plants at five locations in Minnesota, North Dakota, and South Dakota. The evaluation site at the Dickinson Research Extension Center is the only PMC planting in the western Dakotas, and is the driest site. The plots are located south of Interstate Highway 94, at the west edge of Dickinson. The soil type is a Parshall fine sandy loam, which is in North Dakota windbreak suitability group 5. The care and attention that the site has received over the years is the main reason for its continuation and success. The PMC staff has recently completed a summary report of all trees and shrubs tested at four evaluation sites in western North Dakota and South Dakota. The title of this publication is “Trees and Shrubs Tested in Western North Dakota and South Dakota.”

NRCS first signed an agreement with the North Dakota Experiment Station (now Research Extension Center) at Dickinson in 1977. The current 15-year agreement between NRCS and the NDSU Research Extension Center expired January 2010. It is currently being updated. We plan on continuing the good working relationship with the Research Extension Center at Dickinson. Central Stark Soil Conservation District and Western Soil Conservation District will be included as cooperators on the new agreement.

The PMC started evaluating tree and shrubs at Dickinson in 1978. Since that time, the PMC staff and field office staff have planted 113 species of trees and shrubs. At the present time, 65 species are under evaluation. This summary does not contain the complete list of woody plants being evaluated. It contains only those plants evaluated during 2010. A separate report containing all data can be found at the NRCS Area Office in Dickinson, or at the Bismarck PMC. Contact Craig Stange at the PMC for additional species information. Copies of this report are available upon request.

OBJECTIVES

1. Conduct evaluation studies to determine the adaptation and performance of woody plant materials for conservation purposes.
2. Conduct advanced evaluation and progeny testing of selected strains of woody plant materials.
3. Establish seed and plant increase of selected accessions
4. Develop, release and promote improved plant materials for public use.

RECENT ACTIVITIES

On May 3, 2010, two accessions of trees and shrubs were planted, including common ninebark from Big Sioux Nursery, accession number 9082891 and Prairie Harvest Germplasm Hackberry, accession number 9034956. The hackberry is a Bismarck Plant Materials release that originated in Polk County, Minnesota. (See plots highlighted in green on the attached map). On May 12, bur oak accession 9094337 was planted. A number of other trees were also planted to replace seedlings which had died the year before. The tree plantings were done as a demonstration by Bob Klein, SCD technician, and Mike Knudson for the 7th and 8th grade students from four local schools.

On Sept. 30, 2010, Mike Knudson, evaluated 17 accessions of trees and shrubs for survival, vigor, height and width. Work continued on trimming dead and damaged branches. Some volunteer seedlings were also removed. Borax was used to treat stumps of live seedlings cut down. This helped prevent sprouting. As evidenced across the state, the newly planted hackberry was heavily browsed by deer. The nannyberry viburnum, at 25 years age, exhibits good vigor, height and spread. This native plant has done well on this site.

The total precipitation in Dickinson for 2009 was about 2.3 inches above normal, with above average rainfall from May-July. During that same period, the monthly mean temperatures were cooler than average.

RELEASES

Since 1973, the PMC has released 16 new selections or cultivars of woody plants. The following releases are planted at Dickinson. Most of them are doing quite well and are available from conservation nurseries. Varieties that are doing the best at Dickinson include 'McDermand' pear, 'Homestead' hawthorn, and 'Regal' Russian almond. The McDermand pear seems to have better drought resistance than the 'Midwest' crabapple, which is declining in vigor. The pear does have showy flowers in the spring, which attracts bees and other insects. The fruit is quite firm, but becomes more edible to wildlife after a frost. Deer do not appear to browse or rub on the pear very often. We suggest they be planted as often as possible in various conservation plantings. A number of field plantings of McDermand (formerly Harbin) pear were made for landowners in Stark County in the 1960s. Some of these trees may still be surviving.

Formal Releases with Supporting Documentation from the Dickinson Site

'Midwest' Manchurian crabapple	1973
'Cardan' green ash	1979
'Oahe' hackberry	1982
'Sakakawea' silver buffaloberry	1984
'Centennial' European cotoneaster	1987
'McDermand' Ussurian or Harbin pear	1990
'Homestead' Arnold hawthorn	1993
'Regal' Russian almond	1997
'Legacy' late lilac	1999
'Prairie Red' hybrid plum	2006
'McKenzie' black chokeberry	2008

ACKNOWLEDGEMENTS

This research is sponsored and supported by North Dakota State University, Research Extension Center at Dickinson; the NRCS Field Office and Area Office at Dickinson; and the staff of the Central Stark and Western SCDs. Appreciation goes to the permanent and seasonal field staff at the Research Extension Center for the special attention given to the maintenance of the test plots.

Helping People Help the Land

All programs and services are offered on a nondiscriminatory basis.

OFF-CENTER EVALUATIONS: TECHNICAL REPORT – 2010

Study 38I346K University of Minnesota, North Central Research and Outreach Center, Grand Rapids, Minnesota.

Study Title: Field Evaluation of Woody Plant Materials.

Introduction: There is a need to evaluate the performance of shrub and tree species/cultivars for windbreaks, wildlife, and recreational plantings under diverse soil and climatic conditions. To meet this need, field evaluation planting sites representative of the major land resource areas are located in the three States served by the PMC. These sites provide planting locations under long-term land tenure for assemblies of trees and shrubs to be evaluated under uniform culture and management. New material can be added on an annual basis. Comparisons are made with previously released cultivars and area of adaptation determined.

Objective: The objective is to assemble and evaluate woody plant materials for conservation use. Superior cultivars will be selected and released for increase by commercial nurseries.

Cooperators: The USDA Natural Resources Conservation Service, Plant Materials Center, Bismarck, North Dakota, in cooperation with the University of Minnesota, North Central Research and Outreach Center, Grand Rapids, Minnesota. The cooperative agreement expires June 13, 2011. Final evaluation occurred in 2010.

Location: University of Minnesota, North Central Experiment Station, Grand Rapids, Minnesota. Legal Description: NW ¼ SW ¼ sec. 14, T. 55 N., R. 25 W.

Major Land Resource Area: This site is located in Major Land Resource Area 88, Northern Minnesota Glacial Lake Basins. More than 80 percent of this area is forested, with the remainder used for growing feed grains and forage. The area is nearly level, with elevations ranging from 980 to 1,300 feet.

Soils: The soils at this site are Morph and Rosy very fine sandy loams. The Morph very fine sandy loam is poorly drained, with seasonal high water table at a depth of 1-3 feet. The Rosy very fine sandy loam is moderately well drained, with a seasonal high water table at a depth of 3-5 feet. These are woodland soils. These soils are well suited to aspen, balsam fir, and black ash. Morph soil is in the Conservation Tree/Shrub Suitability Group 2, and Rosy soil is in Group 3.

Climate: The average annual precipitation for MLRA 88 is from 20 to 27 inches, with 40 to 50 inches of snowfall in the winter. The average annual temperature is 35 to 40 degrees F, with an average freeze-free period of 95 to 105 days. The plant hardiness zone for this site is 3, with an average annual minimum temperature of -30 to -40 degrees F. Climatic data for 2010 at Grand Rapids, Minnesota, the nearest official weather station, is shown in Table GR-1.

Methods and Materials

Assembly: Refer to Table GR-2 for a list of woody species planted from 1996 to 2008. Some of the accessions were moved from the old site.

Planting Plan: The plots are not randomized or replicated but organized systematically for evaluation and demonstration purposes. The site is divided into four blocks (refer to Figure GR-1). Block 1 is planted to shrubs, Block 2 to medium trees, Block 3 to tall trees, and Block 4 to conifers. Each block is arranged into single row, non-replicated plots. Each plot contains 1 to 10 plants. Spacing is 20 feet between rows and 5 feet within row for shrubs and 10 feet within row for trees. Row length is 100 feet. Like species and standards of comparison are planted in adjacent plots whenever possible.

Plot Preparation: A clean, firm planting site was prepared by application of glyphosate and roto-tilling.

Planting Method: All trees and shrubs were hand planted using approved forestry methods. Accessions from the old FEP were moved using a tree spade.

Planting Date: Refer to Table GR-2 for planting dates of woody species planted from 1996 to 2008.

Fertilization: No fertilizer has been applied to the planting area.

Weed Control: Mechanical weed control, rotary mowing between row, and roto-tilling and hand hoeing in row.

Biological Control: No insecticides have been applied. There has been some damage by deer browsing.

Irrigation: Trees were not watered at time of establishment.

Crop Residue Management: No cover crop has been seeded; a perennial grass cover is maintained between rows.

Silvicultural Practices: Minor pruning has been done each year to remove dead or damaged branches.

Evaluations and Measurements: Plant performance data is recorded during the growing season for the first three years. After the third year, data is gathered according to a specific schedule. The trees and shrubs were evaluated for survival, canopy width, plant height, vigor, insect and disease, and animal damage. Select data appears in this report. Annual summary reports have been prepared since 2006 and can be requested from the PMC.

Results

Plant Performance: Eighty-one accessions of 65 species have been evaluated. Maintenance on this site is good. The previous site was poorly drained, causing lack of vigor in many species. Due to those site conditions, that study was terminated 12/31/95 and relocated to a more suitable site. The following accessions exhibit potential for further evaluation and use:

<u>Accession Number</u>	<u>Genus/Species Origin/Source</u>	<u>Plot Location</u>
ND-2103 PI-399414	European cranberrybush <i>Viburnum opulus</i> P.I. Station, Ames, IA USDA, NRCS, PMC, Bismarck, ND	II/07/1-5
'McKenzie' PI-323957	black chokeberry <i>Photinia melanocarpa</i> P. I. Station, Ames, IA USDA, NRCS, PMC, Bismarck, ND	II/06/11-20
ND-21 9034900	nannyberry <i>Viburnum lentago</i> USDA, NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	III/05/1-9
ND-428 9005970	black walnut <i>Juglans nigra</i> NDSU/USDA, NRCS, PMC, Bismarck, ND	IV/5/6-10
9063158	Scots pine <i>Pinus sylvestris</i> var. <i>mongolica</i> China NRCS, PMC, Bismarck, ND	I/5/1-5
9063126	Japanese elm <i>Ulmus davidiana</i> var. <i>japonica</i> PFRA, Indianhead, Saskatchewan, Canada NRCS, PMC, Bismarck, ND	IV/3/1-5

<u>Accession Number</u>	<u>Genus/Species Origin/Source</u>	<u>Plot Location</u>
ND-3791 9030302	Norway spruce <i>Picea abies</i> U of MN, St. Paul, MN Grand Rapids, MN FEP	I/6/6-10
9063151	Dahurian larch <i>Larix olgensis</i> China NRCS, PMC, Bismarck, ND	II/6/1-5
9069170	English oak <i>Quercus robur</i> Russia USDA, ARS, Mandan, ND	IV/3/6-10
9058847	black spruce <i>Picea mariana</i> U of MN, Cloquet, MN Grand Rapids, MN OCEP	I/4/1-8
9063156	Scots pine <i>Pinus sylvestris</i> Russia, Altai region USDA, NRCS, PMC, Bismarck, ND	1/5/6-10
9069164	Scots pine <i>Pinus sylvestris</i> var. <i>mongolica</i> China USDA, NRCS, PMC, Bismarck, ND	1/7/6-10
9063143	red tatarian honeysuckle <i>Lonicera tatarica</i> Grand Rapids, MN OCEP	II/6/1-10
9006094	wafer ash <i>Ptelea trifoliata</i> Lincoln-Oakes Nursery, Bismarck, ND	II/7/6-10
9063115	green ash <i>Fraxinus pennsylvanica</i> Itasca State Park, MN USDA, NRCS, PMC, Bismarck, ND	IV/2/6-10
9082891	common ninebark <i>Physocarpus opulifolius</i> Big Sioux Nursery, Watertown, SD	II/9/31-35

Figure GR-1. Grand Rapids Woody Field Evaluation Planting – Plot Layout

Row	BLOCK I CONIFERS		BLOCK II SHRUBS		
12					
11					
10					↑ N
9	9019593 juniper	9082609 Meyer's spruce	winterberry bittersweet leadplant gr dogwood Freedom hnsuckle r.l.hawthorn ninebark		
8	9069162 Dahurian larch	9069163 Dahurian larch	caragana highbush cranberry	silky willow Siberian dogwood gray dogwood nannyberry	
7	9069172 Scotch pine	9069164 Scotch pine	ND-2103 highbush cranberry	hazel hybrids Bailey chokeberry	
6	9063151 Dahurian larch	ND-3791 Norway spruce	9063143 r.t.honeysuckle	McKenzie chokeberry	
5	9063158 scotch pine	9063156 scotch pine	Silver Sands sandbar willow	9019576 juneberry	
4	<-----9058847 black spruce ----->		redleaf rose rugosa rose	9076734 seaberry	
3	9069168 Siberian larch	9082610 Siberian larch	Legacy late lilac	Survivor false indigo	
2	open (too wet)	9082611 Siberian larch	Centennial cotoneaster	Indigo silky dogwood	
1	open (too wet)	9076718 Scotch pine	Arnolds Red Regal Russian almond		
Row	BLOCK III MEDIUM TREES		BLOCK IV TALL TREES		
12					
11					
10					
9					
8		skunkbush sumac open			
7	9082631 Japanese birch	ND-624 wafer ash	9082639 N. pin oak	9092051 northern catalpa	open
6	9076737 black cherry	Shadblow svcbry Sheridan chokecherry	9091967 pin cherry	9082633 black ash	9092052 swamp white oak
5	<-----ND-21 nannyberry----->		9057412 bur oak	9005970 black walnut	9082674 sugar maple
4	9076722 Euro. white birch	9047209 chokecherry	9076742 butternut	9076743 chestnut	9082667 gray birch
3	Midwest Manch. crabapple	9069129 amur chokecherry	9063126 Japanese elm	9069170 English oak	9082675 Manchurian ash
2	McDermand Ussurian pear	Magenta crabapple	9069177 bur oak	9063115 green ash	9082650 S. poplar
1	Homestead a. hawthorn	9082739 ironwood	Oahe hackberry	Cardan green ash	9082892 white poplar

revised 6/09 (no new entries in 2010)

Table No. GR-1: 2010 Weather Summary - Official Station - Grand Rapids, Minnesota					
	Mean Temperature		Precipitation (inches)		
	(degrees Fahrenheit)		Actual		Deviation from Normal
Month	2010	Normal*	2010	Normal*	2010
January	9.4	6.4	1.04	1.01	0.03
February	15.5	14.0	0.28	0.61	-0.33
March	37.6	26.4	0.78	1.25	-0.47
April	48.7	41.1	1.12	1.84	-0.72
May	55.4	54.3	2.91	2.90	0.01
June	62.1	62.9	5.23	4.60	0.63
July	69.3	67.4	5.86	4.60	1.26
August	69.0	65.0	4.84	3.70	1.14
September	53.0	54.9	3.93	3.08	0.85
October	47.8	43.7	2.48	2.74	-0.26
November	30.5	26.9	1.37	1.59	-0.22
December	11.4	12.1	1.87	0.86	1.01
Annual	42.5	39.6	31.71	28.78	2.93
* National Climate Data Center 1971-2000 Monthly Normals					
		2010			
	Last Frost (28 degrees)	9-May			
	First Frost (28 degrees)	18-Oct			
	Frost Free Period	161 days			

Key to Table GR-2. 38I346K Field Evaluation of Woody Plant Materials – Grand Rapids, Minnesota

PLOT LOCATION = plot location of the plant material within the evaluation
ACCESSION NUMBER = any accession number, PI number or cultivar name assigned to the plant material
PLANT SYMBOL = plant symbol of the genus and species (asterisk indicates the symbol is not official)
GENUS/SPECIES = common name and scientific name of the plant material
ORIGIN/SOURCE = origin and/or source of the plant material
TRANS DATE = month and day the plant material was transplanted at the evaluation site
YR PLT = year the plant materials were transplanted at the evaluation site
YR REC = year of record
MATL PLTD = type of material planted, PLBR = bareroot, CONT = containerized
NO PLTS = number of plants planted in the plot
NO SRV = number of plants surviving
PCT SRV = percent of plants surviving
VI = plant vigor (1=excellent, 3=good, 5=fair, 7=poor, 9=very poor)
CAN COV (ft) = canopy cover measured in feet
PLT HT (ft) = plant height measured in feet

Table GR-2.

Project No.: 38I346K Field Evaluation of Woody Plant Materials, Grand Rapids, Minnesota

Year of Record: 2010

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
I/1/6-10	9076718	PISYM	Scots pine <i>Pinus sylvestris</i> var. <i>mongolica</i> China USDA, NRCS, PMC, Bismarck, ND	25-May 99	99	CONT		5	5	100	2	0.8	1.0	healthy plants, good bud set
					00				5	100	2	1.4	1.9	
					01				5	100	2	2.7	3.5	
					03				5	100	3	4.2	5.8	
					05				5	100	4	6.3	9.0	
					08				5	100	2	11.1	14.8	
I/2/6-10	9082611	LASI	Siberian larch <i>Larix sibirica</i> NDFS, Towner, ND	30-Apr 98	98	CONT(S)		5	5	100	3	0.4	1.0	
					99				4	80	4	0.8	1.4	needle tips brown
					00				3	60	5	1.1	2.0	
					02				3	60	4	2.3	3.6	
					04				3	60	4	2.9	7.4	
					07				3	60	2	5.1	9.8	
I/3/1-5	9069168	LASI	Siberian larch <i>Larix sibirica</i> Russia USDA, NRCS, PMC, Bismarck, ND	30-Apr 98	98	CONT(P)		5	0	0				
					99				4	80	6	1.0	1.8	
					00				4	80	2	1.0	2.5	
					04				4	80	4	4.6	8.6	
					07				4	80	3	9.1	17.3	
I/3/6-9	9082610	LASI	Siberian larch <i>Larix sibirica</i> NDFS, Towner, ND	30-Apr 98	98	CONT(S)		4	4	100	3	0.6	1.4	
					99				4	100	4	1.2	1.8	
					00				4	80	2	1.8	2.9	
					02				4	80		4.2	5.6	
					04				4	80	3	6.1	9.7	
					07				4	80	3	9.5	16.7	
I/4/1-8	9058847	PIMA	black spruce <i>Picea mariana</i> U of MN, Cloquet, MN Grand Rapids, MN FEP	29-May 96	96	tree		8	8	100	4	3.1	5.8	
					97	spade by			8	100	2	3.5	6.6	light seed production on all
					98	IRRRB			8	100	2	4.1	7.3	light cone production
					00				8	100	2	5.8	10.6	all have cones
					02				8	100	2	5.8	10.6	
					05				8	100	2	8.8	17.4	mod-heavy cones

Project No.: 38I346K Field Evaluation of Woody Plant Materials, Grand Rapids, Minnesota

Year of Record: 2010

PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		PLT <u>HT</u>	<u>REMARKS</u>					
											<u>VI</u>	<u>(ft)</u>							
I/5/1-5	9063158	PISYM	Scots pine	15-May 96	96	96	CONT(S)	5	5	100	3	0.6	0.8						
			<i>Pinus sylvestris</i> var. <i>mongolica</i>									97	5		100	1	1.1	1.4	
			China									98	5		100	1	1.7	2.3	
			USDA, NRCS, PMC, Bismarck, ND									00	5		100	2	4.3	5.1	
												02	5		100	2	4.3	5.1	
												05	5		100	2	10.2	14.7	
	10	5	100	3	12.0	23.0	broken branches 1,3												
I/5/6-10	9063156	PISY	Scots pine	15-May 96	96	96	CONT(S)	5	5	100	3	0.7	0.8						
			<i>Pinus sylvestris</i>									97	5		100	2	1.1	1.3	
			Russia, Altai region									98	5		100	1	1.9	2.3	
			USDA, NRCS, PMC, Bismarck, ND									00	5		100	2	4.7	5.8	
												02	5		100	2	4.7	5.8	
												05	5		100	2	8.9	15.8	double stem 4,5
	10	5	100	2	25.0	broken branches, split trunk 5													
I/6/1-5	9063151	LAOL	Dahurian larch	15-May 96	96	96	PLBR	5	5	100	4	0.7	1.6						
			<i>Larix olgensis</i>									97	5		100	3	1.6	2.3	
			China									98	5		100	2	3.1	4.2	
			USDA, NRCS, PMC, Bismarck, ND									00	5		100	3	6.0	8.4	
												02	5		100	3	6.0	8.4	
												05	5		100	2	12.5	20.6	
	10	5	100	2	20.0	31.0													
I/6/6-10	ND-3791 9030302	PIAB	Norway spruce	29-May 96	96	96	tree	5	5	100	3	5.0	7.7						
			<i>Picea abies</i>									97	5		100	2	5.5	8.6	
			U of MN, St. Paul, MN									98	5		100	2	6.0	10.2	few cones
			Grand Rapids, MN FEP									00	5		100	2	8.9	15.3	
												02	5		100	2	8.9	15.3	
												05	5		100	2	14.4	21.9	
	10	5	100	3	16.4	33.7													

Project No.: 38I346K Field Evaluation of Woody Plant Materials, Grand Rapids, Minnesota

Year of Record: 2010

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
I/7/1-5	9069172	PISY	Scots pine	15-May	97	97	CONT(P)	5	5	100	3	0.5	0.6	
			<i>Pinus sylvestris</i>			98			5	100	3	1.0	1.3	
			Altai Region, Russia			99			5	100	3	1.9	2.2	
			USDA, NRCS, PMC, Bismarck, ND			01			5	100	3	4.0	6.1	
						03			5	100	3	6.8	9.6	
						05			5	100	2	11.2	13.8	
I/7/6-10	9069164	PISY	Scots pine	30-Apr	98	98	CONT(P)	5	5	100	3	0.6	1.1	
			<i>Pinus sylvestris</i> var. <i>mongolica</i>			99			5	100	3	1.5	1.9	
			China			00			5	100	3	2.7	3.3	
			USDA, NRCS, PMC, Bismarck, ND			02			5	100	3	5.2	6.3	
						05			5	100	2	9.3	12.3	few cones
						07			5	100	2	13.1	16.1	
I/8/1-5	9069162	LAOL	Dahurian larch	30-Apr	98	98	CONT(P)	5	4	80	3	1.7	2.3	
			<i>Larix olgensis</i>			99			5	100	3	2.0	2.7	
			China			00			5	100	3	2.8	4.4	
			USDA, NRCS, PMC, Bismarck, ND			02			5	100	3	5.6	8.2	
						04			5	100	3	8.7	13.5	dead leader 2,5
						07			5	100	2	12.7	21.2	
I/8/6-10	9069163	LAOL	Dahurian larch	30-Apr	98	98	CONT(P)	5	1	20	5	1.1	2.0	
			<i>Larix olgensis</i>			99			2	40	4	1.6	2.8	
			China			00			5	100	6	1.3	3.3	
			USDA, NRCS, PMC, Bismarck, ND			02			5	100	4	3.7	5.0	
						04			5	100	3	6.9	10.2	
						07			5	100	3	11.6	21.9	
I/9/1-5	9019593	JUCO6	common juniper	24-May	05	05		5	5	100	3	1.3	1.0	
			<i>Juniperus communis</i>			06			5	100	4	1.4	1.0	
			Wilton Mine site, Wilton, ND			07			5	100		1.1	0.9	
						09			5	100	4	2.3	1.4	

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<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
1/9/6-10	9082609	PICEA	Meyer spruce	18-May	01			5	5	100	3	0.9	0.9	
			<i>Picea meyeri</i>		02				5	100	6	1.0	1.0	
			Itasca Greenhouse, Cohasset, MN		03				5	100	3	1.2	1.4	
					05				5	100	2	2.5	2.3	
					07				5	100	3	4.0	4.3	
					10				5	100	2	6.8	9.3	
II/1/1-5	'Arnolds Red' 9069080	LOTA	red tatarian honeysuckle	15-May	96		CONT(P)	5	2	40	3	1.4	1.9	
			<i>Lonicera tatarica</i>		97				2	40	1	2.1	2.6	
			Lee Nursery, Fertile, MN		98				2	40	1	3.3	4.4	
			USDA, NRCS, PMC, Bismarck, ND		00				2	40	2	4.5	6.2	
					02				2	40	2	4.5	6.2	
					05				2	40	5	6.8	8.7	
					10				2	40	7	9.0	10.0	plants declining
II/1/6-20	'Regal' 9006079 PI-540042	PRTE5	Russian almond	15-May	96		PLBR	15	15	100	4	0.7	1.7	
			<i>Prunus tenella</i>		97				15	100	4	0.9	1.5	pear slug on 7,12,14
			USDA, NRCS, PMC, Bismarck, ND		98				15	100	5	1.1	1.9	blight on 8
			Lincoln-Oakes Nursery, Bismarck, ND		00				15	100	5	2.8	2.5	lots of almonds on 12
					02				8	54	4	4.5	3.5	some plants are going out
					05				8	54	5	6.8	4.5	
					10				8	54	7	5.0	5.0	declining, many dead branches
II/2/1-10	'Centennial' PI-113095 9005729	COIN16	European cotoneaster	15-May	96		PLBR	10	9	90	4	1.0	1.9	leaf wilt and spotty on 6
			<i>Cotoneaster integerrimus</i>		97				6	60	4	2.0	2.3	pear slug on all
			USDA, NRCS, PMC, Bismarck, ND		98				6	60	4	4.8	4.0	
			Lincoln-Oakes Nursery, Bismarck, ND		00				6	60	4	7.7	6.8	lots of fruit on 2-5,7
					02				7	70	2	11.5	8.0	heavy fruit
					05				5	50	3	12.2	8.9	good fruit
					10				5	50	3	15.0	12.0	

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PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
II/2/11-20	'Indigo'	COAM2	silky dogwood	15-May 96	96	PLBR		10	6	60	3	1.4	1.9	
			<i>Cornus amomum</i>		97				7	70	2	4.2	3.3	
			USDA, NRCS, PMC, Rose Lake, MI		98				7	70	2	7.4	5.1	
			Lincoln-Oakes Nursery, Bismarck, ND		00				7	70	1	11.1	8.0	heavy fruit on all
					02				7	70	2	13.5	10.0	excellent vigor
					05				7	70	2	14.0	11.8	good fruit, dense inrow suckering
					10				8	80	2	19.0	15.0	
II/3/1-10	'Legacy'	SYVI3	late lilac	15-May 96	96	PLBR		10	10	100	4	0.6	1.4	
	ND-83		<i>Syringa villosa</i>		97				10	100	4	0.7	1.2	
	PI-540443		USDA, NRCS, PMC, Bismarck, ND		98				10	100	4	1.6	2.1	chlorosis on all, caused
			Lincoln-Oakes Nursery, Bismarck, ND		00				10	100	5	4.1	4.3	by drainage
					02				10	100	4	7.0	6.8	variable height
					05				10	100		8.4	7.5	variable height, vigor
					10				10	100	3	10.5	9.6	
II/3/11-20	Survivor	AMFR	false indigo	15-May 96	96	PLBR		10	10	100	3	1.5	2.6	3,4 chlorotic
	Germplasm		<i>Amorpha fruticosa</i>		97				10	100	3	2.6	2.6	
	9008041		USDA, NRCS, PMC, Aberdeen, ID		98				10	100	3	5.1	3.6	
			USDA, NRCS, PMC, Bismarck, ND		00				9	90	2	9.0	4.7	
			Lincoln-Oakes Nursery, Bismarck, ND		02				10	100	3	11.0	5.5	annual dieback/ good regrowth
					05				10	100	4	5.0	5.0	decline, winterkill, fair regrowth
					10				8	80	7	6.0	6.0	plants in decline
II/4/1-5	9082685	RORU2	redleaf rose	18-May 01	01	PLBR		5	5	100	5	0.9	1.7	
			<i>Rosa rubrifolia</i>		02				5	100	4	1.2	2.2	1 not red
			Lincoln-Oakes Nursery, Bismarck, ND		03				5	100	5	1.6	2.8	
					05				4	80	4	3.5	4.5	dieback on 2
					07				3	60		3.0	3.8	
					10				3	60	7	3.2	3.7	
II/4/6-10	9057406	RORU	rugosa rose	18-May 01	01	PLBR		5	5	100	6	1.0	1.0	
			<i>Rosa rugosa</i>		02				4	80	4	1.6	1.9	
			Lincoln-Oakes Nursery, Bismarck, ND		03				4	80	4	2.0	2.2	
					05				4	80		4.5	3.4	4,5 winter dieback
					07				4	80		5.9	3.7	
					10				4	80	4	9.0	5.6	

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<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
II/4/11-20	9076734	HIRH80	seaberry	15-May 96	96	PLBR		10	10	100	4	0.6	1.1	
			<i>Hippophae rhamnoides</i>		97				10	100	4	0.9	1.4	
			Lincoln-Oakes Nursery, Bismarck, ND		98				10	100	5	1.4	2.1	
					00				10	100	3	4.0	4.4	
					02				9	90	2	8.5	8.3	good vigor, some short
					05				7	70	4	11.0	10.4	varied height
					10				7	70	6	15.0	11.0	declining, many dead branches
II/5/1-10	Silver Sands Germplasm ND-3902 9035212	SAIN3	sandbar willow	15-May 96	96	CONT(S)		10	9	90	3	3.1	3.5	
			<i>Salix interior</i>		97				10	100	1	5.2	4.5	leaf rust all, no suckering yet
			USDA, NRCS, PMC, Bismarck, ND		98				10	100	1	8.4	7.4	
					00				10	100	1	11.8	8.8	
					02				10	100	2	15.0	11.0	excellent vigor
					05				8	80	4	11.3	9.8	25% winterkill
					10				10	100	4	9.7	9.4	
II/5/11-20	9019576	AMAL2	juneberry	15-May 96	96	PLBR		10	9	90	3	1.0	1.2	
			<i>Amelanchier alnifolia</i>		97				10	100	2	1.6	1.7	
			Lincoln-Oakes Nursery, Bismarck, ND		98				10	100	3	3.0	2.2	powdery mildew on 5,6
					00				10	100	4	5.0	3.0	
					02				10	100	4	4.5	3.8	browsed
					05				10	100		7.0	4.4	average fruit, leaf rust on 20%
					10				10	100	6	8.5	6.5	leaf rust on all plants
II/6/1-10	9063143	LOTA	red tatarian honeysuckle	29-May 96	96	hand		10	10	100	5	1.5	2.0	
			<i>Lonicera tatarica</i>		97	transplant			10	100	5	1.6	2.4	severe girdling by rabbits
			Grand Rapids FEP		98	from FEP			10	100	3	2.3	2.7	
					00				10	100	3	4.1	5.0	
					02				10	100	2	5.5	7.5	excellent vigor
					05				10	100	2	9.2	8.9	excellent vigor
					10				10	100	2	14.5	12.0	

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PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
LOCATION	NUMBER	SYMBOL	ORIGIN/SOURCE	DATE	PLT	REC	PLTD	PLTS	SRV	SRV	VI	(ft)	(ft)	REMARKS
II/6/11-20	'McKenzie' PI-323957	PHME13	black chokeberry	29-May	96	96	tree	9	9	100	3	1.9	1.8	
			<i>Photinia melanocarpa</i>		97	97	spade		9	100	3	2.1	2.1	pear slug on 5-9
			P.I. Station, Ames, IA		98	98	by IRRRB		9	100	2	2.6	2.4	
			old FEP site, Grand Rapids, MN		00	00			9	100	2	4.1	3.7	
					02	02			9	100	1	7.2	4.5	excellent vigor
					05	05			9	100	3	7.3	6.7	
		10	10			9	100	2	11.5	9.7				
II/7/1-5	ND-2103	VIOPA2	European cranberrybush	29-May	96	96	tree	10	5	100	3	3.6	2.7	
			<i>Viburnum opulus</i> var. <i>americanum</i>		97	97	spade		5	100	3	4.2	3.9	leaf spot on 3,4
			P.I. Station, Ames, IA		98	98	by IRRRB		5	100	1	2.4	2.4	leaf spot on all
			old FEP site, Grand Rapids, MN		00	00			5	100	2	5.9	6.0	
					02	02			5	100	5	5.8	6.2	2 dieback
					05	05			4	80	4	5.7	6.2	
		10	10			4	80	5	8.4	7.6	dieback on 1, boxelder in row			
II/7/11-20	10 new accessions	CORYL	hazel hybrids	29-May	96	96	CONT	10	10	100	4	0.3	0.4	leaf damage on 6,7,8
			<i>Corylus</i>		97	97			10	100	4	0.7	1.2	
			Badgersett Research Farm, Canton, MN		98	98			10	100	4	1.8	2.1	
					00	00			10	100	3	4.0	4.2	
					02	02			10	100	4	5.6	5.1	variable heights
					05	05			10	100	5	5.8	6.7	
		10	10			9	90	6	7.8	9.3				
II/7/21-25	9091971	PHME13	black chokeberry	24-May	05	05		5						data missing
			<i>Photinia melanocarpa</i>		06	06			5	100	3	1.9	2.6	
			Bailey Nurseries, St. Paul, MN		07	07			5	100	3	1.8	2.5	
					09	09			5	100	4	1.4	2.4	all browsed
II/8/1-5	9082747	VIOPA2	American cranberrybush	15-May	06	06	CONT	5	5	100	3	0.7	1.2	
			<i>Viburnum opulus</i> var. <i>americanum</i>		07	07			4	80	6	0.4	0.8	
			Bottineau Co., ND		08	08			5	100	6	0.3	1.0	
			USDA, NRCS, PMC, Bismarck, ND		10	10			5	100	7	0.9	1.3	

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<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
II/8/6-10	9069052	SALIX	silky willow	15-May	06	06		5	4	80	4	1.0	1.5	
	Riverbend germplasm		<i>Salix</i>			07			4	80	5	0.6	1.4	
			USDA, NRCS, PMC, East Lansing, MI			08			4	80	6	0.8	1.7	
						10			4	80	4	2.2	2.7	
II/8/11-15	9082664	COSES	Siberian dogwood	10-May	00	00	PLBR	5	5	100	3	0.7	2.5	
			<i>Cornus sericea</i> ssp. <i>sericea</i>			01			5	100	3	3.7	2.5	
			Lawyer Nursery, Plains, MT			02			5	100		4.8	3.8	
						04			5	100	3	6.6	5.5	
						06			5	100	5	8.0	6.1	
						09			5	100	4	8.9	7.1	
II/8/16-20	9082738	CORA6	gray dogwood			03	PLBR	5	5	100	3	1.1	1.8	
			<i>Cornus racemosa</i>			04			5	100		1.8	2.2	
			Wisconsin (Lawyer)			07			5	100	4	2.1	2.9	
			Lincoln-Oakes Nursery, Bismarck, ND			09			5	100	4	2.9	3.4	2 fruit, leaf spot 3,5
II/8/16-20	9092141	VILE	nannyberry	May	07	07		5	5	100	3	0.3	1.7	
			<i>Viburnum lentago</i>			08			5	100	4	0.4	1.8	leaf spot on 1
			Schumacher's, Heron Lake, MN			09			5	100	4	0.5	1.9	
II/9/1-5	9082711	EUBU6	winterberry euonymus			02	PBLR	5	5	100	4	1.0	2.6	
			<i>Euonymus bungeanus</i>			03			5	100	5	1.1	2.2	
			Lincoln-Oakes Nursery, Bismarck, ND			04			5	100	3	2.0	2.9	dieback 5
						06			5	100		3.4	3.9	
						08			5	100	3	4.0	4.8	
II/9/6-10	9082712	CESC	bittersweet			02	PLBR	5	5	100	2	1.0	1.4	
			<i>Celastrus scandens</i>			03			5	100	4	0.8	1.7	
			Lincoln-Oakes Nursery, Bismarck, ND			04			5	100	3	0.8	2.2	
						06			3	60		2.3	2.6	
						08			3	60	3	1.6	3.0	height of 2nd wire

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II/9/11-15	9082678	AMCA6	leadplant	02	02		PLBR	5	5	100	6	0.7	0.8	
			<i>Amorpha canescens</i>		03				4	80	5	0.7	1.1	
			Lincoln-Oakes Nursery, Bismarck, ND		04				4	80		0.8	1.3	
					06				4	80		1.7	2.1	
					08				4	80	3	2.4	2.4	
II/9/16-20	9082890	CORA6	gray dogwood	04	04		PLBR	5	5	100	3	0.8	1.9	
			<i>Cornus racemosa</i>		05				5	100	4	1.8	2.7	
			Big Sioux Nursery, Watertown, SD		06				5	100	4	1.6	2.4	
					08				5	100	4	1.9	2.5	leaf spot on 4, browse on all
					10				5	100	4	2.8	3.0	browse on all, leaf fungus 1,2,3
II/9/21-25	'Freedom'	LOKO2	honeysuckle	03	03		PLBR	5	4	80	3	2.2	2.5	
			<i>Lonicera korolkowii</i>		04				4	80		3.2	3.3	
			Lincoln-Oakes Nursery, Bismarck, ND		05				4	80	3	5.1	5.4	
					08				4	80	3	9.1	7.4	
					09				4	80	4	8.9	7.7	
II/9/26-30	9076686	CRCH	roundleaf hawthorn	25-May	04	04	PLBR	5	2	40	4	0.4	1.1	
			<i>Crataegus chrysoarpa</i>		05				3	60	5	0.9	1.8	
			Lincoln-Oakes Nursery, Bismarck, ND		06				5	100	5	1.1	1.7	
					08				5	100	5	1.4	2.6	
					10				4	80	4	2.9	4.3	browse damage 3,4
II/9/31-35	9082891	PHOP	common ninebark	25-May	04	04	PLBR	4	4	100		0.7	1.9	
			<i>Physocarpus opulifolius</i>		05				4	100		2.6	3.8	
			Big Sioux Nursery, Watertown, SD		06				4	100		5.9	5.0	
					08				4	100	3	7.8	7.1	
					10				4	100	2	11.0	8.5	
III/1/1-5	'Homestead' PI-503530	CRAN6	arnold hawthorn	15-May	96	96	PLBR	5	5	100	3	1.0	1.6	
			<i>Crataegus X anomala</i>		97				5	100	3	1.6	2.3	pear slug 1,2,5
			NRCS, PMC, Bismarck, ND		98				5	100	3	2.8	4.1	
			Lincoln-Oakes Nursery, Bismarck, ND		00				5	100	2	5.8	8.7	
					02				5	100	2	9.0	11.0	very nice fruit on all, no apple rust
					05				5	100	2	10.0	14.5	
					10				5	100	3	16.8	17.2	leaf spot on all

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III/1/6-10	9082739	OSVI	ironwood	May 07	07			5	5	100	3	0.4	1.3	3,5 browsed
			<i>Ostrya virginiana</i>		08				3	60	6	0.9	1.5	planted into row of cut back, stump sprouting
			Sertoma Park, Bismarck, ND											
			USDA, NRCS, PMC, Bismarck, ND		09				5	100	6	0.7	1.3	2,3 browsed
III/2/1-5	'McDermand' PI-478004	PYUS2	Ussurian pear	15-May 96	96		PLBR	5	5	100	3	1.2	2.4	leaf miner on 5
			<i>Pyrus ussuriensis</i>		97				5	100	3	1.8	3.2	
			USDA, NRCS, PMC, Bismarck, ND		98				5	100	3	3.2	5.2	
			Lincoln-Oakes Nursery, Bismarck, ND		00				5	100	3	7.0	9.8	
					02				5	100	3	9.5	12.3	no fruit on 2
					05				5	100	2	15.0	19.4	
					10				5	100	2	22.2	25.1	tar spot
III/2/6-10	'Magenta'	MABA	hybrid crabapple	15-May 96	96		PLBR	5	5	100	4	0.9	1.9	
			<i>Malus</i> sp.		97				5	100	3	1.8	2.5	
			USDA, NRCS, PMC, East Lansing, MI		98				5	100	4	3.1	3.7	
					00				5	100	4	6.0	6.7	
					02				5	100	4	8.0	9.1	1 heavy fruit, 3 poor, 4 blue fruit
					05				5	100	5	9.6	12.9	5 half dead
					10				5	100	4	20.0	18.9	
III/3/1-5	'Midwest' PI-478000	MAMA37	Manchurian crabapple	15-May 96	96		PLBR	5	5	100	4	1.4	2.3	
			<i>Malus mandshurica</i>		97				5	100	1	3.1	3.4	
			USDA, NRCS, PMC, Bismarck, ND		98				5	100	2	5.2	5.5	
			Lincoln-Oakes Nursery, Bismarck, ND		00				5	100	3	10.1	10.1	
					02				5	100	3	13.7	14.2	1 broke main stem, 3 v. good fruit
					05				5	100	3	12.8	16.3	
					10				5	100	4	20.8	18.2	
III/3/6-10	9069129	PRMA9	amur chokecherry	15-May 96	96		CONT(P)	5	5	100	3	2.5	3.4	mech. damage on 4
			<i>Prunus maackii</i>		97				5	100	2	3.2	4.0	
			Big Sioux Nursery, Watertown, SD		98				5	100	3	4.4	6.1	
					00				5	100	3	7.5	9.6	
					02				5	100	3	11.9	13.8	4- nice form
					05				5	100	2	12.4	18.8	clean leaves, no disease
					10				5	100	3	20.0	22.0	

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III/4/1-5	9076722	BEPE3	European white birch <i>Betula pendula</i> USDA, ARS, Mandan, ND	15-May 96	96	96	PLBR	5	5	100	4	2.5	3.6	leaf miner on 3
					97				5	100	3	4.0	5.0	
					98				5	100	2	7.0	7.8	
					00				5	100	3	12.2	13.3	
					02				5	100	3	15.0	17.7	
					05				5	100	5	12.4	22.5	dead tops on 3 and 4 removed
					10				0	0				
III/4/6-10	9047209	PRVI	chokecherry <i>Prunus virginiana</i> Lincoln-Oakes Nursery, Bismarck, ND	15-May 96	96	96	PLBR	5	5	100	5	0.9	1.9	
					97				5	100	3	1.5	2.4	shot hole on 1
					98				5	100	4	2.7	4.0	2 suckering
					00				5	100	5	4.9	6.7	shot hole on 1, blackknot on 3
					02				5	100	4	8.6	10.2	1&3 leaf dmg; 2,3,4,5 blackknot
					05				4	80	6	8.5	14.8	blackknot & shot hole disease removed, sprayed with Tordon
					10				0	0				
III/5/1-9	ND-21 9034900	VILE	nannyberry <i>Viburnum lentago</i> USDA, NRCS, PMC, Bismarck, ND Grand Rapids, MN FEP	29-May 96	96	96	tree	9	9	100	4	3.0	5.3	leaf rust on 2
					97		spade by		9	100	4	3.4	5.2	mod-severe leaf rust on all
					98		IRRRB		9	100	3	3.6	5.2	
					00				9	100	4	4.5	5.8	
					02				8	89	4	5.4	6.1	fruit on 1
					05				8	89	4	5.4	8.1	powder mildew on 3 & 4
					10				8	89	5	4.0	9.0	4 yellow
III/6/1-5	9076737	PRSE2	black cherry <i>Prunus serotina</i> Apple Valley FEP Lincoln-Oakes Nursery, Bismarck, ND	15-May 97	97	97	PLBR	5	5	100	3	0.9	1.5	
					98				5	100	4	2.7	3.5	
					99				5	100	4	3.9	4.8	leaf spot
					01				5	100	4	6.4	7.5	
					03				5	100	3	8.0	11.3	
					07				5	100	3	12.7	15.8	
III/6/6-10	9091975	AMLA9	serviceberry <i>Amelanchier lamarckii</i> Lincoln-Oakes Nursery, Bismarck, ND	24-May 05	05	05		5	5	100	3	0.9	2.3	1 browsed
					06				5	100	4	10.5	14.4	
					07				5	100	5	1.3	2.8	all powdery mildew; 4 brown leaves
					09				5	100	5	2.1	3.2	mildew on all

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III/6/11-15	9008183	PRVI	common chokecherry <i>Prunus virginiana</i>	24-May	05	05		5	5	100	3	1.0	2.5	
			Lincoln-Oakes Nursery, Bismarck, ND			06			5	100	3	1.0	2.8	
						07			5	100	4	1.2	4.1	black knot on 2,4
						09			5	100	4	3.3	5.9	
III/7/6-10	9006094	PTTR	wafer ash <i>Ptelea trifoliata</i>	25-May	99	99	PLBR	5	5	100	2	1.1	2.0	very healthy, glossy leaves
	ND-624		Lincoln-Oakes Nursery, Bismarck, ND			00			5	100	2	1.9	2.5	
						01			5	100	3	4.3	4.1	
						03			5	100	3	7.0	5.8	
						05			4	80	3	7.0	7.5	no disease
						08			5	100	3	9.2	9.2	no disease
III/8/6-10	9091954	RHTR	skunkbush sumac <i>Rhus trilobata</i>	7-May	08	08		5	5	100	3	0.4	1.2	
			Cave Hills, SD			09			5	100	7	0.9	1.0	
			USDA, NRCS, PMC, Bismarck, ND			10			5	100	5	1.0	2.4	browsed
IV/1/1-5	'Oahe'	CEOC	hackberry <i>Celtis occidentalis</i>	15-May	96	96	PLBR	5	5	100	4	1.1	2.4	
	PI-476982		NRCS, PMC, Bismarck, ND			97			5	100	3	1.6	2.4	
			Lincoln-Oakes Nursery, Bismarck, ND			98			5	100	4	3.1	3.9	
						00			5	100	4	5.6	7.4	
						02			5	100	3	8.2	11.6	1 very nice tree; 2,3,5 leaf spot; 3 dead leaf tips
						05			5	100	3	8.6	14.8	high variation
						10			5	100	5	15.0	17.5	
IV/1/6-10	'Cardan'	FRPE	green ash <i>Fraxinus pennsylvanica</i>	15-May	96	96	PLBR	5	5	100	3	1.1	2.1	
			NRCS, PMC, Bismarck, ND			97			5	100	2	1.9	3.4	
			Lincoln-Oakes Nursery, Bismarck, ND			98			5	100	4	3.9	5.3	
						00			5	100	3	8.9	10.2	
						02			5	100	3	13.5	15.3	slight defoliation on all
						05			5	100	3	11.2	21.2	
						10			5	100	3	17.0	25.7	

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IV/1/11/15	9082892	POAL7	white poplar <i>Populus alba</i> Big Sioux Nursery, Watertown, SD	25-May	04	04	PLBR	5	5	100	5	0.6	1.9	
						05			5	100	4	2.1	4.2	
						06			5	100	5	4.8	7.4	
						08			5	100	5	9.0	12.5	
						10			5	100	4		17.2	dead top 2,5
IV/2/1-5	9069177	QUMA2	bur oak <i>Quercus macrocarpa</i> E.T. Jacobson, MN USDA, NRCS, PMC, Bismarck, ND	30-Apr	98	98	CONT(P)	5	5	100	6	0.6	0.8	
						99			4	80	6	1.5	2.0	
						00			5	100	5	1.9	2.5	
						02			5	100	6	3.7	4.3	remove per Mike O.
						04			5	100	6	4.3	6.3	
						07			5	100	4	7.0	9.3	
IV/2/6-10	9063115	FRPE	green ash <i>Fraxinus pennsylvanica</i> Itasca State Park, MN USDA, NRCS, PMC, Bismarck, ND	15-May	96	96	CONT(P)	5	5	100	5	0.7	1.4	
						97			5	100	3	0.9	2.3	
						98			5	100	4	3.4	4.3	
						00			5	100	2	7.1	10.9	
						02			5	100	2	11.7	15.8	
						05			5	100	2	12.4	22.5	
						10			5	100	2	20.0	34.0	
IV/2/11-15	9082650	POPUL	Soongarica poplar <i>Populus</i> Valley Nursery, Helena, MT	10-May	00	00	CONT	5	5	100	3	1.4	3.5	
						01			5	100	3	5.2	7.8	5 blew over, roots curled
						02			5	100	2	8.5	12.7	
						05			5	100	3		28.1	
						06			5	100	3	12.9	31.7	3 top missing
						09			3	60	4	21.3	36.7	
IV/3/1-5	9063126	ULJA	Japanese elm <i>Ulmus davidiana</i> var. <i>japonica</i> PFRA, Indianhead, Saskatchewan, Canada USDA, NRCS, PMC, Bismarck, ND	15-May	96	96	CONT(P)	5	5	100	3	3.0	3.0	
						97			5	100	2	4.7	4.5	
						98			5	100	2	7.7	6.3	
						00			5	100	2	12.5	11.8	
						02			5	100	2	15.5	14.5	
						05			5	100	2	20.0	20.1	
						10			5	100	3	28.0	25.8	

Project No.: 38I346K Field Evaluation of Woody Plant Materials, Grand Rapids, Minnesota

Year of Record: 2010

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT									
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>							
IV/3/6-10	9069170	QURO2	English oak	15-May	96	96	PLBR	5	5	100	4	0.7	0.9								
			<i>Quercus robur</i>												97	5	100	3	1.2	1.5	deer browse on 1,3,4,5
			Russia												98	5	100	3	3.6	3.6	
			USDA, ARS, Mandan, ND												00	5	100	3	8.1	10.4	
															02	5	100	2	10.6	15.2	
															05	5	100	2	14.2	20.7	
		10	5	100	2	28.0	34.0														
IV/3/11-15	9082675	FRMA5	Manchurian ash	10-May	00	00	PLBR	5	5	100	0.7	2.1									
			<i>Fraxinus mandshurica</i>												01	4	80	4	1.5	2.4	
			Lincoln-Oakes Nursery, Bismarck, ND												02	4	80	4	1.5	2.4	leaf spots on 3
															04	4	80	3	2.4	7.5	leaf wilt on 3, double leader 4,5
															06	4	80	4	4.9	11.4	
															09	4	80	4	6.5	15.3	leaf spot on 3
IV/4/1-5	9076742	JUCI	butternut	29-May	96	96	CONT	5	4	80	5	0.8	1.6								
			<i>Juglans cinerea</i>												97	3	60	3	0.7	1.7	
			Aitkin Co., MN												98	4	80	4	2.4	1.9	
			Itasca Greenhouse, Cohasset, MN												00	4	80	5	4.2	3.9	
															02	4	80	4	6.9	6.6	
															05	4	80	4	10.2	11.8	
		10	4	80	4	15.0	19.2														
IV/4/6-10	9076743	CADE12	chestnut	29-May	96	96	CONT	5	2	40	3	1.0	1.5								
			<i>Castanea dentata</i>												97	2	40	3	0.7	1.8	
			Itasca Greenhouse, Cohasset, MN												98	2	40	3	1.7	2.2	
															00	2	40	4	3.3	4.2	
															02	2	40	4	5.2	6.2	
															05	2	40	7	4.5	9.4	struggling
		10	2	40	5	11.0	13.0														
IV/4/11-15	9082667	BEPO	gray birch	10-May	00	00		5	5	100	4	1.2	3.2								
			<i>Betula populifera</i>												01	4	80	4	3.4	4.5	
			Lawyer Nursery, Plains, MT												02	4	80	4	3.4	4.5	
															04	4	80	4	8.1	12.3	
															06	4	80	2	11.6	18.3	
															09	4	80	2	15.5	26.8	

Project No.: 38I346K Field Evaluation of Woody Plant Materials, Grand Rapids, Minnesota

Year of Record: 2010

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT			
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>	
IV/5/1-5	9057412	QUMA2	bur oak	29-May	96	96	tree	4	4	100	4	2.0	2.5		
			<i>Quercus macrocarpa</i>		97	97	spade by		4	100	3	2.4	3.3		
			Foster Co., ND		98	98	IRRRB		4	100	3	5.2	5.3		
			USDA, NRCS, PMC, Bismarck, ND		00	00			4	100	3	8.0	7.9		
					02	02			4	100	3	9.6	10.2		
					05	05			4	100	4	10.2	13.6		
		10	10			4	100			15.5	20.4				
IV/5/6-10	9005970	JUNI	black walnut	29-May	96	96	tree	5	5	100	5	2.8	2.9		
			<i>Juglans nigra</i>		97	97	spade by		5	100	2	1.7	2.6		
			NDSU		98	98	IRRRB		5	100	3	5.3	4.4		
			USDA, NRCS, PMC, Bismarck, ND		00	00			5	100	3	7.3	6.6		
					02	02			5	100	3	8.6	8.8		
					05	05			5	100	4	8.2	12.3		
		10	10			5	100	4	13.2	15.9					
IV/5/11-15	9082674	ACSA3	sugar maple	10-May	00	00	PLBR	5	5	100	3	1.0	1.8		
			<i>Acer saccharum</i>		01	01			2	40	5	1.5	1.8		
			Polk Co., MN		02	02			5	100	6	1.4	2.0		
			Lincoln-Oakes Nursery, Bismarck, ND		04	04			4	80	4	1.8	4.3		
					06	06			3	60	5	3.4	7.2		
					09	09			4	80	5	5.8	10.5		
IV/6/1-5	9091967	PRPE2	pin cherry	7-May	08	08		5	5	100	3	0.7	2.3		
			<i>Prunus pensylvanica</i>		09	09			5	100	5	1.0	2.3	all browsed	
			Big Sioux Nursery, Watertown, SD		10	10			5	100	7	1.2	2.3	major browse damage	
IV/6/5-10	9082633	FRNI	black ash	25-May	99	99	PLBR	5	5	100	6	0.5	1.0		
			<i>Fraxinus nigra</i>		00	00			5	100	5	0.8	1.3		
			Lawyer Nursery, Plains, MT		01	01			4	80	4	1.4	2.0		
					03	03			4	80	3	2.3	3.1		
					05	05			4	80			3.3	5.8	
					08	08			4	80			5.8	11.4	

Project No.: 38I346K Field Evaluation of Woody Plant Materials, Grand Rapids, Minnesota

Year of Record: 2010

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
IV/6/11-15	9092052	QUBI	swamp white oak	15-May	06	06	PLBR	5	5	100	3	0.8	1.4	
			<i>Quercus bicolor</i>			07			4	80	5	0.5	1.1	
			Lincoln-Oakes Nursery, Bismarck, ND			08			3	60	5	0.7	1.3	
						10			2	40	4	1.5	2.2	insect damage on leaf margins
IV/7/6-10	9092051	CASP8	northern catalpa	15-May	06	06	PLBR	5	5	100		0.6	0.8	
			<i>Catalpa speciosa</i>			07			5	100	6	0.3	0.7	
			Big Sioux Nursery, Watertown, SD			08			5	100	5	0.4	0.8	
						10			2	40	3	1.0	1.5	major browse 3



2010 Report Off-Center Evaluation Planting of Woody Plant Materials Grand Rapids, Minnesota

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INTRODUCTION

The Plant Materials Center (PMC), located at Bismarck, North Dakota, was established in 1954 as part of the U.S. Department of Agriculture's Soil Conservation Service, now the Natural Resources Conservation Service (NRCS). The Bismarck PMC serves the States of Minnesota, North Dakota, and South Dakota. Tree and shrub improvement has always been an integral part of the plant materials program in Minnesota. There is a need to evaluate how different trees and shrubs will perform in diverse soil and climatic conditions. The PMC currently has tree and shrub evaluation sites at five locations in the three-state area, including three sites in Minnesota.

A long-term agreement, effective through June 13, 2011, has been developed with the USDA Natural Resources Conservation Service; the University of Minnesota, North Central Research and Outreach Center at Grand Rapids, Minnesota; the Itasca Soil and Water Conservation District (SWCD); and the Iron Range Resource and Rehabilitation Board, Mineland Reclamation Division, Chisholm, Minnesota. The Major Land Resource Area is 88, Northern Minnesota Glacial Lakes Basins. Soils are Morph and Rosy very fine sandy loams with seasonal high water tables from 1 to 5 feet. Long-term average rainfall is 28.78 inches. The site is directly across Highway 169 south of the Research and Outreach Center. An earlier site had been established north of the research facility but proved to be too wet. The first trees and shrubs were planted at the new site beginning in 1996. Several entries were moved with a tree spade (noted in the Technical Report) from the old site to the new site. The site is maintained with cultivation and herbicides. Quackgrass and reed canarygrass are the main perennial weeds. Poor performing entries are removed and replaced as needed. Pruning and removal of contaminant species such as boxelder is done on a routine basis. New entries planted each year are flagged for hand weeding. Measurements and notes are taken each year in late summer. Rainfall for 2010 was almost 1 inch below average in April, average for May, and considerably above average June through September. Overall, the plants looked in good health and vigor when evaluated, and were not stressed.

OBJECTIVES

1. Conduct evaluation studies to determine the adaptation and performance of woody plant materials for conservation purposes.
2. Conduct advanced evaluation and progeny testing of selected strains of woody plant materials.
3. Establish seed and plant increase of selected accessions.
4. Develop and release improved plant materials for public use.

ACTIVITIES IN 2010

Approximately 75 accessions of 50 different species are currently being evaluated. No new entries were planted in 2010. Weed control and maintenance in the past has primarily been done by staff at the North Central Research and Outreach Center and the Itasca County SWCD and NRCS field office. The Outreach Center is reorganizing workloads and responsibilities and will no longer be involved with maintenance of the these plots. Maintenance was contracted out this year, and consisted of mowing several times annually in 2009 and 2010. The agreement with the North Central Research Center expires in 2011.

NRCS field office staff helped collect data on selected entries on August 17, 2010. Fifteen accessions were measured for crown spread and plant height, disease and insect damage, drought and cold tolerance, fruit production, survival, vigor, and animal damage. Tree species and accessions that are continuing to perform well are gray birch, English oak, Japanese elm, green ash (Itasca Co. origin), Meyer's spruce, bur oak, black cherry, Ussurian pear, and white poplar. Most of the older conifers continue to do well. Newer shrub entries looking good include common juniper, black chokeberry, bittersweet, common ninebark, leadplant, nannyberry, winterberry euonymus, bittersweet, and 'Freedom' honeysuckle. The Homestead hawthorn was severely affected with leaf spot disease.



Most conifers have performed well at the Grand Rapids site.

Complete data collection is summarized annually and documented in the Bismarck PMC Annual Technical Report. Anyone who desires a copy of the latest data summary information can contact Dwight Tober at (701) 530-2075 or Dwight.Tober@nd.usda.gov, or the Grand Rapids NRCS field office (218) 326-6596. The report is about 20 pages in length.

NEW RELEASES

Data collected from this site was used to support the formal release of two new shrubs formally released in 2005 cooperatively with the Minnesota Agricultural Experiment Station (MAES). Silver Sands germplasm sandbar willow and Survivor germplasm false indigo were both planted in 1996. They had good survival and excellent vigor and overall plant performance. Both species are subject to natural die-back, but generally re-sprout vigorously. Silver Sands was cut to the ground in the plots several years ago, and has vigorously grown to almost the previous height in one year. A release brochure for both releases together was completed in 2006 and is available on the Bismarck PMC homepage (<http://Plant-Materials.nrcs.usda.gov>) for these two new releases, or it can be ordered from the Bismarck PMC.

‘McKenzie’ black chokeberry was transplanted (tree spade) to the site in 1996 and has performed well. It was officially released as a cultivar in 2008 with numerous partners including MAES. Black chokeberry is currently a high interest fruit species because of the quantity and quality of fruit it produces. It is considered one of the healthiest foods on the market because of the high content of antioxidants and vitamins in the berries. It is also gaining a reputation for making excellent juice, jelly, and wine.

SUMMARY OF ACCOMPLISHMENTS

Selected accessions/cultivars that have performed well at the Grand Rapids site and show promise for additional testing and/or promotion for conservation use include the following:

‘Cardan’ green ash	‘Oahe’ hackberry
‘McDermid’ Ussurian pear	9082610 Siberian larch
‘Indigo’ silky dogwood	Dahurian larch (9063151, 9069162)
9069170 English oak	9063143 tatarian honeysuckle
Silver Sands germplasm sandbar willow	9047238 seaberry
9082667 gray birch	Survivor germplasm false indigo
9063115 green ash	‘Homestead’ Arnold hawthorn
9058847 black spruce	9063126 Japanese elm
9069172 Scots pine	9069164 Scots pine
9076718 Scots pine	9063158 Scots pine
‘Centennial’ cotoneaster	9063156 Scots pine
‘Midwest’ Manchurian crabapple	9057412 bur oak
9030302 Norway spruce	‘McKenzie’ black chokeberry
9005970 black walnut	9082631 Japanese birch
9076737 black cherry	9069129 Amur chokecherry
9006094 wafer ash	ND-2103 European cranberry

Data from this planting has been used to document the cooperative release of the cultivars listed below. These cultivars are generally available from local conservation nurseries and are used in conservation plantings throughout the Northern Great Plains and Upper Midwest. Several more releases are anticipated in the near future. Information gathered concerning plant performance

assists cooperating nurserymen and plant researchers in determining the range of adaptation of many other accessions/cultivars also included in the test planting.

Formal Releases with Supporting Documentation from the Grand Rapids Site

'Regal' Russian almond	1997
'Legacy' late lilac	1999
Silver Sands germplasm sandbar willow	2005
Survivor germplasm false indigo	2005
'McKenzie' black chokeberry	2008



Fruit of 'McDermant' Harbin pear is hard and apple-like. Harbin pear was planted in 1996, and was 19 feet tall and 15 feet wide in 2005. It was rated in high vigor.

ACKNOWLEDGMENTS

This research is sponsored and supported by the University of Minnesota, North Central Research and Outreach Center at Grand Rapids; the NRCS field office and Itasca County SWCD at Grand Rapids; the NRCS area office at Duluth; and the NRCS State office at St. Paul. Appreciation goes to staff at the NRCS and SWCD field office for the special attention given to care and maintenance of the test plots.

Helping People Help the Land

All programs and services are offered on a nondiscriminatory basis.

OFF-CENTER EVALUATION PLANTINGS: TECHNICAL REPORT – 2010

Study 38I347K University of Minnesota, Sand Plain Experimental Research Farm, Becker, Minnesota.

Study Title: Field Evaluation of Woody Plant Materials.

Introduction: There is a need to evaluate the performance of shrub and tree species/cultivars for windbreaks, wildlife, and recreational plantings under diverse soil and climatic conditions. To meet this need, field evaluation planting sites representative of the major land resource areas are located in the three States served by the PMC. These sites provide planting locations under long-term land tenure for assemblies of trees and shrubs to be evaluated under uniform culture and management. New material can be added on an annual basis. Comparisons are made with previously released cultivars and area of adaptation determined.

Objective: The objective is to assemble and evaluate woody plant materials for conservation use. Superior cultivars will be selected and released for increase by commercial nurseries.

Cooperators: The USDA Natural Resources Conservation Service, Plant Materials Center, Bismarck, North Dakota, in cooperation with the University of Minnesota, Sand Plain Experimental Research Farm, Becker, Minnesota. The cooperative agreement expired August 9, 2010, and is in the review and renewal process.

Location: University of Minnesota, Sand Plain Experimental Research Farm, Becker, Minnesota. Legal Description: NW 1/4 SW 1/4 sec. 31, T. 34 N., R. 28 W.

Major Land Resource Area: This site is located in Major Land Resource Area 91, Wisconsin and Minnesota Sandy Outwash. About 90 percent of this area is in farms. The area is nearly level, with elevations averaging around 980 feet above sea level.

Soils: The soils at this site are a Hubbard-Mosford complex. Hubbard is formed from leached coarse and medium sand outwash. Drought and wind erosion are major management problems. Hubbard and Mosford soils are in Conservation Tree/Shrub Suitability Group 7.

Climate: The average annual precipitation for Sherburne County is 26 to 30 inches. The average annual temperature is 40 to 45 degrees F, with an average freeze-free period of 135 days. The plant hardiness zone for this site is 3, with an average annual minimum temperature of -30 to -40 degrees F. Climatic data for 2010 at the nearest official weather station, Elk River, Minnesota, is shown in Table BE-1.

Methods and Materials

Assembly: Refer to Table BE-2 for a list of woody species planted from 1998 to 2010.

Planting Plan: The plots are not randomized or replicated but organized systematically for evaluation and demonstration purposes (Figure BE-1). The site is divided into four blocks (refer to Figure BE-2). Block 1 is planted to shrubs, Block 2 to medium trees, Block 3 to tall trees, and Block 4 to conifers. Each block is arranged into single row, non-replicated plots. Each plot contains 1 to 10 plants. Spacing is 20 feet between rows and 5 feet within row for shrubs and 10 feet within row for trees. Row length is 100 feet. Like species and standards of comparison are planted in adjacent plots whenever possible.

Plot Preparation: A clean, firm planting site was prepared by roto-tilling.

Planting Method: All trees and shrubs were hand planted using approved forestry methods.

Planting Date: Refer to Table BE-2 for planting dates of woody species planted from 1998 to 2010.

Fertilization: No fertilizer has been applied to the planting area.

Weed Control: Mechanical weed control, rotary mowing between row, and roto-tilling and hand hoeing in row.

Biological Control: No insecticides have been applied. There has been very minor deer browse damage.

Irrigation: Trees have been hand watered at time of planting.

Crop Residue Management: On May 20, 2003, Block I (shrubs) was seeded between rows to a cover of 50 percent Bad River blue grama and 50 percent Pierre sideoats grama.

Silvicultural Practices: Minor pruning has been done each year to remove dead or damaged branches.

Evaluations and Measurements: Plant performance data is recorded during the growing season for the first three years. After the third year, data is gathered according to a specific schedule. The trees and shrubs were evaluated for survival, canopy width, plant height, vigor, insect and disease, and animal damage. Select data appears in this report. Annual summary reports have been prepared since 2006 and can be requested from the PMC.

Results

Plant Performance: One hundred and twelve accessions of 90 species are being evaluated. Maintenance on this site is excellent. The following accessions exhibit potential for further evaluation and use.

<u>Accession Number</u>	<u>Genus/Species Origin/Source</u>	<u>Plot Location</u>
'Schubert'	chokecherry <i>Prunus virginiana</i> Lincoln-Oakes Nursery, Bismarck, ND	II/1/6-10
9069164	Scots pine <i>Pinus sylvestris</i> var. <i>mongolica</i> China USDA, NRCS, PMC, Bismarck, ND	IV/3/6-10
9069162	Dahurian larch <i>Larix olgensis</i> China USDA, NRCS, PMC, Bismarck, ND	IV/2/6-10
'McKenzie' 323957	black chokeberry <i>Photina melanocarpa</i> Lincoln-Oakes Nursery, Bismarck, ND	IA/3/1-5
ND-170	European cotoneaster <i>Cotoneaster integerrimus</i> USDA, NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	I/5/11-20
9082667	gray birch <i>Betula populifera</i> Lawyer Nursery, Plains, MT	II/9/1-5
9082891	common ninebark <i>Physocarpus opulifolius</i> Big Sioux Nursery, Watertown, SD	IA/9/1-5

Figure BE-1. Sand Plain Experimental Farm plot layout

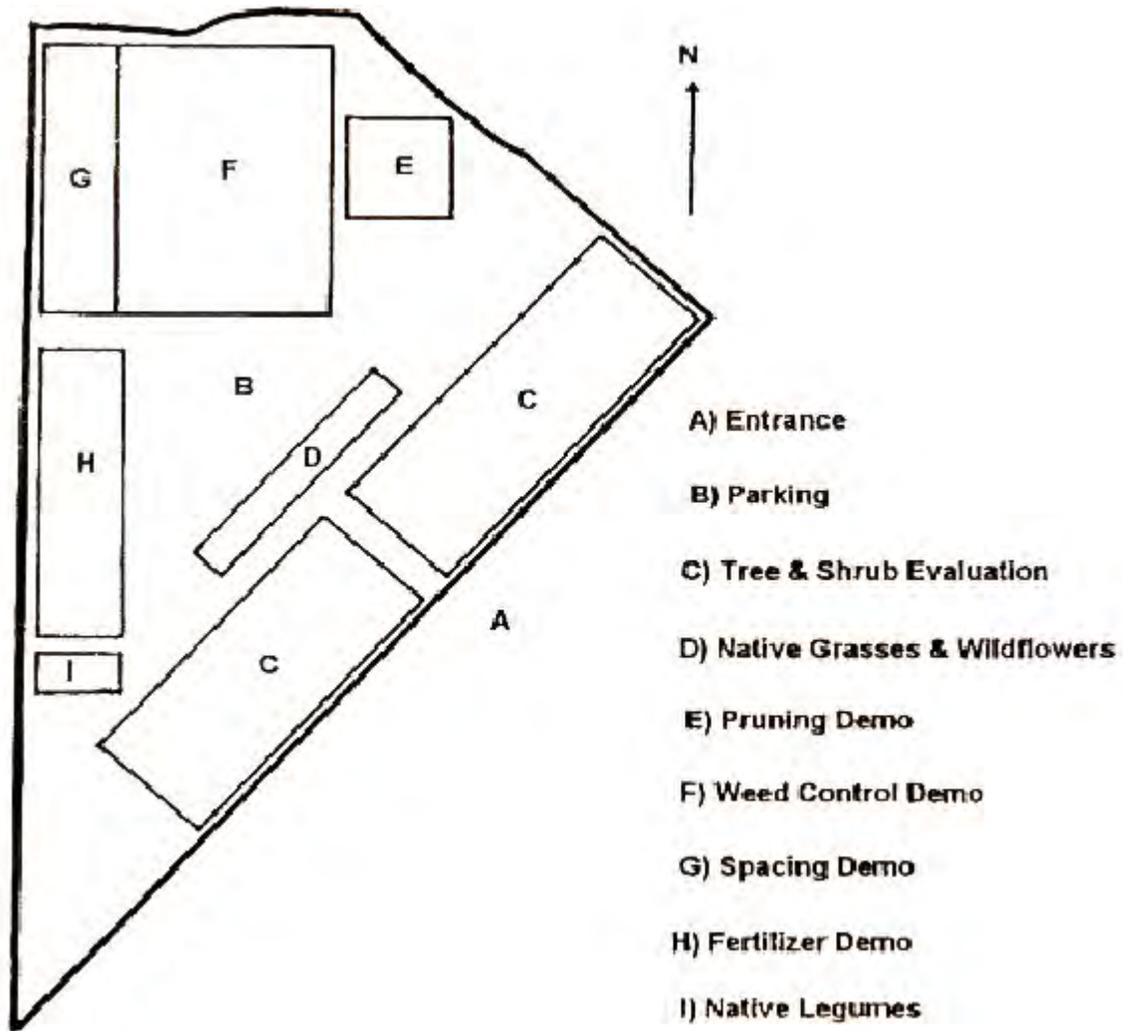


Figure BE-2. Becker Woody Off Center Evaluation Planting – Plot Layout

Row	BLOCK IV CONIFERS			
5				
4	9069172 Scotch pine	Canaan fir		
3	9069163 Dahurian larch	9069164 Scotch pine		
2	9069168 Siberian larch	9069162 Dahurian larch		
1	9082610 Siberian larch	9082611 Siberian larch		
Row	BLOCK III TALL TREES			
14	9082739 ironwood	9092231 lodgepole pine		
13	9082639 northern pin oak	cedar		
12	9094334 American linden	Scotch pine		
11	ND-686 Pekin lilac	9094336 Freeman maple		
10	9082885 aspen (Towner)	9082633 black ash		
9	9082609 Meyer's spruce	9094335 littleleaf linden		
8	9076735 Ohio buckeye	9076737 black cherry		
7	9069178 red pine	9076731 bur oak		
6	Hunter ponderosa pine	9063148 amur corktree		
5	9063127 white ash	9076730 silver maple		
4	9063115 green ash	9063116 black ash		
3	Cardan green ash	9019586 green ash		
2	Oahe hackberry	9019578 hackberry		
1	9076739 oak hybrid	9069177 bur oak		
Row	BLOCK II MEDIUM TALL TREES			
9	9082667 gray birch	9092051 northern catalpa		
8	9092052 swamp white oak	9082675 Manchurian ash		
7	9069129 amur chokecherry	9082666 black birch		
6	Homestead arnold hawthorn	9069121 mayday		
5	McDermand Ussurian pear	9076733 nannyberry		
4	PH hackberry Oahe hackberry			
3	9047209 chokecherry	ND-1733 plum		
2	9030971 amur maple	Schubert chokecherry		
1	Roselow sarg. crabapple	Midwest Manch. crabapple		
Row	BLOCK I SHRUBS		BLOCK 1A SHRUBS	
10	Legacy late lilac	9019621 lilac	apricot Caragana frutex skunkbush sumac pin cherry	
9	Scarlet Mongolian cherry	9019579 Sib. pea shrub	TigerEyes sumac nannyberry MO hazelnut MO plum	
8	Konza aromatic sumac	Regal Russian almond	com. ninebark Am. hazelnut PrairieRed plum staghorn sumac	
7	9019576 juneberry	Shadblow svcbry arrowwood	mugo pine seaberry wayfaring bush roundleaf hawthorn	
6	9019581 Pekin cotoneaster	9019605 sand cherry	pr. rose M. gooseberry	pin cherry b.l. honeysuckle
5	Centennial E. cotoneaster	ND-170 Euro. cotoneaster	leadplant chokeberry	chokecherry Red River pr.cordgr.
4		A Amber sk.sumac Am.h.cranberry	Nero chokbry Viking chokbr	winterberry E. bittersweet
3	9076729 gray dogwood (open)	9094333 elderberry	redleaf rose rugosa rose	black currant cupplant
2	9019580 redosier dogwood	Indigo silky dogwood	chokeberry Sib.dogwood	slough sedge sweetgrass
1	Arnolds Red honeysuckle	9063143 r.t. honeysuckle	Survivor false indigo	9082632 Mong. pea shrub
			9019611 golden currant	Silver Sands sandbar willow

revised 6/10

Table No. BE-1: 2010 Weather Summary - Official Station - Buffalo, Minnesota

Month	Mean Temperature		Precipitation (inches)		
	(degrees Fahrenheit)		Actual		Deviation from Normal
	2010	Normal*	2010	Normal*	2010
January	9.9	10.2	0.57	0.78	-0.21
February	15.4	16.8	0.78	0.64	0.14
March	36.2	29.2	1.34	1.56	-0.22
April	51.8	44.2	1.81	2.30	-0.49
May	57.2	57.9	3.10	3.26	-0.16
June	65.0	67.2	7.17	4.39	2.78
July	72.2	71.4	3.63	3.91	-0.28
August	71.4	68.9	3.65	4.24	-0.59
September	57.3	59.2	7.34	2.96	4.38
October	50.6	47.5	1.63	2.19	-0.56
November	32.6	31.3	1.26	1.81	-0.55
December	14.3	16.3	2.31	0.78	1.53
Annual	44.5	43.3	34.59	28.82	5.77
* National Climate Data Center 1971-2000 Monthly Normals					
		2010			
Last Frost (28 degrees)		9-Apr			
First Frost (28 degrees)		29-Oct			
Frost Free Period		202 days			

Key to Table BE-2. 38I347K Field Evaluation of Woody Plant Materials – Becker, Minnesota

PLOT LOCATION = plot location of the plant material within the evaluation
ACCESSION NUMBER = any accession number, PI number or cultivar name assigned to the plant material
PLANT SYMBOL = plant symbol of the genus and species (asterisk indicates the symbol is not official)
GENUS/SPECIES = common name and scientific name of the plant material
ORIGIN/SOURCE = origin and/or source of the plant material
TRANS DATE = month and day the plant material was transplanted at the evaluation site
YR PLT = year the plant materials were transplanted at the evaluation site
YR REC = year of record
MATL PLTD = type of material planted, PLBR = bareroot, CONT = containerized
NO PLTS = number of plants planted in the plot
NO SRV = number of plants surviving
PCT SRV = percent of plants surviving
VI = plant vigor (1=excellent, 3=good, 5=fair, 7=poor, 9=very poor)
CAN COV (ft) = canopy cover measured in feet
PLT HT (ft) = plant height measured in feet

Table BE-2.

Project No.: 381347K Field Evaluation of Woody Plant Materials, Becker, Minnesota

Year of Record: 2010

PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		<u>REMARKS</u>				
											COV <u>VI</u>	PLT <u>(ft)</u>					
I/1/1-10	'Arnolds Red' 9069080	LOTA	red tatarian honeysuckle	1-May 96	96	96	CONT(P)	10	10	100	4	2.0	2.1				
			<i>Lonicera tatarica</i>								5	1.8	2.1				
			Lee Nursery, Fertile, MN								2	2.6	4.1				
			USDA, NRCS, PMC, Bismarck, ND								4	4.4	5.3				
											3	4.8	6.1		All fair fruit; yellow leaf tips		
											4	5.0	7.3				
I/1/11-20	'Hawkeye' 9063143	LOTA	red tatarian honeysuckle	1-May 96	96	96	CONT(P)	10	10	100	3	1.7	1.9				
			<i>Lonicera tatarica</i>								4	1.5	2.4				
			Iowa								2	2.2	3.0				
			Lincoln-Oakes Nursery, Bismarck, ND								2	5.1	5.2				
			USDA, NRCS, PMC, Bismarck, ND								2	5.8	6.5				
											3	6.7	7.7		good vigor		
I/2/1-10	9019580	COSES	redosier dogwood	1-May 96	96	96	PLBR	10	10	100	3	1.2	2.5	browse on 3,4			
			<i>Cornus sericea</i> ssp. <i>sericea</i>								2	2.6	3.0				
			Lincoln-Oakes Nursery, Bismarck, ND								2	5.1	4.0				
											9	90	8.4		5.8		
											10	100	1		7.7	5.6	some leaf rust throughout all
											3	9.0	6.9		mostly dead		
I/2/11-20	'Indigo' 468117	COAM2	silky dogwood	1-May 96	96	96	PLBR	10	10	100	4	1.7	2.1				
			<i>Cornus amomum</i>								2	3.2	2.9				
			USDA, NRCS, PMC, E. Lansing, MI								1	7.2	4.8				
											9	90	2		9.6	6.4	
											3	9.8	7.3				
											5	10.5	7.3		dieback on 1,2; resprout on 4		
	6	5.0	6.2	50% dieback, mostly resprouts													

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<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
I/3/1-10	9076729	CORA6	gray dogwood <i>Cornus racemosa</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96		PLBR	10	10	100	3	1.4	1.9	browse on 2,3
					97				10	100	3	2.2	2.8	
					98				10	100	2	5.4	4.9	
					00				10	100	2	7.8	6.5	
					02				10	100	2	8.0	7.4	
					05				10	100	4	7.0	7.5	
					10				10	100	5	5.6	6.2	
I/3/6-10	9094333	SANIC4	common elderberry <i>Sambucus nigra</i> ssp. <i>canadensis</i> Big Sioux Nursery, Watertown, SD	4-May 10	10		PLBR	5	3	60	6	0.5	0.5	
1/4/11-15	'Autumn Amber'	RHTR	skunkbush sumac <i>Rhus trilobata</i> USDA, NRCS, PMC, Los Lunas, NM	7-May 09	09			5	5	100	3	1.1	0.7	
					10				5	100	3	1.1	1.0	
1/4/16-20	9094281	VIOPA2	American highbush cranberry <i>Viburnum opulus</i> var. <i>americanum</i> Big Sioux Nursery, Watertown, SD	7-May 09	09			5	5	100	3	1.4	1.6	
					10				5	100	4	1.8	1.6	
I/5/1-10	'Centennial' 113095 9005729	COIN16	European cotoneaster <i>Cotoneaster integerrimus</i> USDA, NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96		PLBR	10	10	100	5	1.6	1.6	browse on 7
					97				9	90	4	1.6	1.6	some dieback on 2,7
					98				9	90	4	4.0	3.9	
					00				9	90	3	8.5	5.2	
					02				9	90	3	8.6	6.0	
					05				10	100	2	9.5	5.5	excellent fruit
					10				10	100	7	7.0	6.0	
I/5/11-20	ND-170 9005728	COIN16	European cotoneaster <i>Cotoneaster integerrimus</i> USDA, NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96		PLBR	10	10	100	3	1.8	2.0	
					97				10	100	5	2.1	2.0	leaf spots
					98				10	100	4	3.7	2.9	
					00				10	100	2	7.3	4.1	
					02				10	100	2	7.2	4.5	
					05				10	100	3	6.3	4.5	
					10				10	100	7	6.0	4.0	80% leaves gone 8/18

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I/6/1-10	9019581	COAC	Pekin cotoneaster	1-May	96		PLBR	10	10	100	5	1.0	1.6	
			<i>Cotoneaster acutifolia</i>		97				10	100	3	1.7	2.2	dieback
			Lincoln-Oakes Nursery, Bismarck, ND		98				10	100	3	3.9	3.6	
					00				10	100	3	6.3	4.9	
					02				10	100	3	6.9	5.6	
					05				10	100	5	6.5	5.5	fireblight on 6,7
					10				10	100	7	6.0	4.0	mostly resprouts
I/6/11-20	9019605	PRPUB	sand cherry	1-May	96		PLBR	10	10	100	3	1.8	2.4	
			<i>Prunus pumilla</i> var. <i>besseyi</i>		97				10	100	3	4.2	2.7	powdery mildew on 2,4,7,9
			Lincoln-Oakes Nursery, Bismarck, ND		98				10	100	4	5.9	2.9	fungus
					00				10	100	3	8.5	3.6	
					02				10	100	3	7.9	3.9	
					05				10	100	3	9.0	4.1	highly variable
					10				0	0				mostly dead
I/7/1-10	9019576	AMAL2	juneberry	1-May	96		PLBR	10	10	100	5	1.0	1.0	
			<i>Amelanchier alnifolia</i>		97				10	100	5	1.4	1.3	
			Lincoln-Oakes Nursery, Bismarck, ND		98				10	100	4	1.7	1.7	
					00				10	100	3	5.2	2.4	
					02				10	100	3	6.1	2.8	
					05				10	100	4	5.5	3.3	all are grown together
					10				10	100	5	6.0	4.3	
1/7/6-10	9091975	AMLA9	serviceberry	12-May	05			5	5	100	6	0.6	1.2	1,4 browsed
			<i>Amelanchier lamarckii</i>		06				4	80	7	0.4	1.0	
			Lincoln-Oakes Nursery, Bismarck ND		07				4	80	4	0.6	1.4	
					09				4	80	5	0.8	1.0	
1/7/11-15	9091976	VIDE	arrowwood viburnum	12-May	05			5	5	100	6	0.6	1.7	dead leaves on 1,4
			<i>Viburnum dentatum</i>		06				2	40	5	0.8	1.4	
			Lincoln-Oakes Nursery, Bismarck, ND		07				4	80	4	1.3	2.1	
					09				4	80	4	1.3	2.1	

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I/8/1-10	'Konza'	RHAR4	aromatic sumac	1-May	96		PLBR	10	7	70	6	0.7	1.1	
	477981		<i>Rhus aromatica</i>		97				7	70	4	1.9	1.9	top dieback - winter injury
			NRCS, PMC, Manhattan, KS		98				7	70	3	5.2	3.5	leaf fungus on 5,6,7,9
			Lincoln-Oakes Nursery, Bismarck, ND		00				7	70		8.3	4.2	
					02				7	70	4	9.2	4.8	
					05				9	90	4	9.5	5.1	
					10				10	100	3	9.0	5.0	
I/8/11-20	'Regal'	PRTE5	Russian almond	1-May	96		PLBR	10	10	100	5	0.7	1.7	
	540442		<i>Prunus tenella</i>		97				10	100	4	1.1	2.1	all suckering except 5
	9006079		NRCS, PMC, Bismarck, ND		98				10	100	5	1.7	2.2	
			Lincoln-Oakes Nursery, Bismarck, ND		00				10	100	4	3.3	2.3	
					02				10	100	4	4.1	2.4	
					05				10	100	5	4.0	2.5	highly variable
					10				0	0				dead
I/9/1-10	'Scarlet'	PRFR2	Mongolian cherry	1-May	96		PLBR	10	10	100	3	1.1	1.3	
	478003		<i>Prunus fruticosa</i>		97				10	100	4	1.6	1.8	severe rabbit damage on 1
			NRCS, PMC, Bismarck, ND		98				10	100	3	2.9	2.7	all suckering
			Lincoln-Oakes Nursery, Bismarck, ND		00				10	100	3	6.8	3.2	
					02				10	100	2	6.8	3.8	
					05				10	100	4	7.3	4.4	variable heights
					10				10	100	3	4-8	3-5	variable, good vigor, grown together
I/9/11-20	9019579	CAAR18	Siberian pea shrub	1-May	96		PLBR	10	10	100	5	0.8	2.0	browse on all
			<i>Caragana arborescens</i>		97				10	100	6	1.1	2.5	
			Lincoln-Oakes Nursery, Bismarck, ND		98				10	100	5	2.0	3.7	insect damage 4,5
					00				10	100	4	4.2	5.0	
					02				10	100	3	6.1	6.2	
					05				10	100	5	6.5	6.9	leaf defoliation
					10				10	100	5	4-6	4-8	lots of variation

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I/10/1-10	'Legacy'	SYVI3	late (villosa) lilac	1-May	96		PLBR	10	10	100	6	0.6	1.1	resprout on 7,9
	ND-83		<i>Syringa villosa</i>		97				10	100	10	0.7	1.3	
	540443		NRCS, PMC, Bismarck, ND		98				10	100	4	1.3	1.9	
	9006228		Lincoln-Oakes Nursery, Bismarck, ND		00				10	100	4	3.5	3.2	
					02				10	100	4	4.6	4.1	
					05				10	100	5	4.5	4.2	variable heights
					10				10	100	5	3-5	2-5	variable heights
I/10/11-20	9019621	SYVU	common lilac	1-May	96		PLBR	10	10	100	5	1.0	1.6	better than late lilac
			<i>Syringa vulgaris</i>		97				10	100	5	1.1	2.2	mildew on 1,8
			Lincoln-Oakes Nursery, Bismarck, ND		98				10	100	3	1.9	2.9	
					00				10	100	4	4.1	4.0	
					02				10	100	3	5.2	5.2	
					05				10	100	4	5.3	6.3	variable heights
					10				10	100	5	4.7	5.5	
IA/1/1-10	9019611	RIAU	golden currant	1-May	96		PLBR	10	10	100	4	1.2	2.1	
			<i>Ribes aureum</i>		97				10	100	6	2.0	2.4	
			Lincoln-Oakes Nursery, Bismarck, ND		98				10	100	7	3.0	3.7	
					00				10	100	3	5.2	4.2	
					02				10	100	4	5.6	4.4	
					05				10	100	5	4.7	4.5	leaves mostly gone-leaf spot
					10				10	100	5	4-6	3-6	leaves 95% gone 8/18
IA/1/11-20	Silver Sands Germplasm	SAIN	sandbar willow	1-May	96		CONT(S)	10	0	0				
	ND-3902		<i>Salix interior</i>		97				3	30	5	1.1	2.0	
	9035212		USDA, NRCS, PMC, Bismarck, ND		98				8	80	6	0.8	1.3	rabbit browse on all
					00				10	100	2	8.4	5.2	
					02				10	100	2	9.1	6.4	
					05				10	100	2	9.0	7.5	
					10				10	100	3	10.0	7.0	

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IA/2/1-10	Survivor	AMFR	false indigo	1-May	96		PLBR	10	10	100	3	2.3	2.7	browse on all
	Germplasm		<i>Amorpha fruticosa</i>		97				10	100	4	3.0	2.2	
	9008041		NRCS, PMC, Bismarck, ND		98				10	100	3	6.3	3.6	
			Lincoln-Oakes Nursery, Bismarck, ND		00				10	100	3	8.2	4.4	
					02				10	100	3	9.6	5.0	
					05				10	100	2	10.0	5.5	
					10				10	100	5	8.4	4.2	
1A/2/11-20	9082632	CAIN	Mongolian peashrub	29-Apr	99		PLBR	10	10	100	3	0.8	1.0	
			<i>Caragana intermedia</i>		00				10	100	3	2.1	1.7	
			Lawyer Nursery, Plains, MT		01				9	90	4	3.6	2.6	
					03				9	90	4	4.8	3.4	
					05				9	90	3	6.0	3.9	
					08				9	90	4	7.3	4.4	dieback on 8, good seed on 10
1A/3/1-5	'McKenzie'	PHME13	black chokeberry	3-May	00		PLBR	5	5	100	2	1.6	1.7	
	323957		<i>Photinia melanocarpa</i>		01				5	100	3	2.3	2.4	
			Lincoln-Oakes Nursery, Bismarck, ND		02				5	100	2	3.6	2.9	
					04				5	100	2	4.1	3.2	
					06				5	100	2	6.4	4.2	
					09				5	100	2	6.8	4.9	
1A/3/6-10	9082664	COALS2	Siberian dogwood	5-May	00		PLBR	5	5	100	2	1.5	2.7	
			<i>Cornus alba</i> var. <i>sibirica</i>		01				5	100	3	3.9	3.1	
			Lawyer Nursery, Plains, MT		02				5	100	2	5.8	4.4	
					04				5	100	3	5.6	5.3	
					06				5	100	4	6.8	5.3	
					09				5	100	5	6.7	5.4	
IA/4/1-5	9082685	RORU2	redleaf rose	16-May	01		PLBR	5	5	100	3	1.8	1.7	
			<i>Rosa rubrifolia</i>		02				5	100	3	2.3	2.8	
			Lincoln-Oakes Nursery, Bismarck, ND		03				5	100	4	2.6	2.6	
					05				5	100	5	2.0	2.3	dieback on all
					07				5	100	5	2.5	1.9	
					10				0	0				dead, removed

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1A/4/6-10	9057406	RORU	rugosa rose	16-May	01	01	PLBR	5	5	100	4	1.2	1.2	
			<i>Rosa rugosa</i>			02			5	100	3	2.7	2.0	
			Lincoln-Oakes Nursery, Bismarck, ND			03			5	100	3	3.6	2.2	
						05			5	100	3	5.3	3.0	good vigor
						07			5	100	2	7.6	3.5	
						10			5	100	2	10.0	4.0	
1A/4/11-15	9082687	RIAM2	black currant	16-May	01	01	PLBR	5	5	100		1.5	1.9	
			<i>Ribes americanum</i>			02			5	100	3	4.0	2.6	
			Big Sioux Nursery, Watertown, SD			03			5	100	3	3.6	3.2	
						05			5	100	3	5.5	3.5	
						07			5	100	3	5.9	3.9	
						10			5	100	3	5.5	3.5	
1A/4/16-20	9082714	SIPEP	cupplant		02	02	CONT	5	5	100	3	0.6	0.3	
			<i>Silphium perfoliatum</i>			03			5	100	3	1.1	3.5	
			USDA, NRCS, PMC, Bismarck, ND			04			5	100				all five okay, height varies
						06			5	100			3.5	all five okay, flowering
						08			5	100			5.5	good growth, some drought stress
1A/5/1-5	'Nero' 9082719	PHME13	chokeberry		02	02	PLBR	5	5	100	3	1.0	1.5	
			<i>Photinia melanocarpa</i>			03			5	100	4	1.4	1.9	
			Northwoods Nursery, Molalla, OR			04			5	100	4	1.7	2.0	
						06			5	100	3	3.2	3.0	
						08			5	100	3	3.7	3.4	
1A/5/6-10	'Viking' 9082720	PHME13	chokeberry		02	02	PLBR	5	5	100	3	1.1	1.4	
			<i>Photinia melanocarpa</i>			03			5	100	3	1.8	2.0	
			Northwoods Nursery, Molalla, OR			04			5	100	3	2.3	2.1	
						06			5	100	2	4.0	3.2	
						08			5	100	2	4.4	3.2	
1A/5/11-15	9082711	EUBU6	winterberry euonymus		02	02	PLBR	5	5	100	3	0.5	2.6	
			<i>Euonymus bungeanus</i>			03			5	100	3	1.4	3.0	
			Lincoln-Oakes Nursery, Bismarck, ND			04			5	100	4	2.6	3.2	3 has seed
						06			5	100	4	4.1	4.1	dark pink fruit on 3
						08			5	100	3	4.5	4.6	upright form on 2

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				DATE	PLT	REC	PLTD	PLTS	SRV	SRV	VI	(ft)	(ft)	
1A/5/16/20	9082712	CESC	bittersweet	02	02		PLBR	5	5	100	3	0.5	1.0	
			<i>Celastrus scandens</i>		03				5	100	3	1.2	2.4	
			Lincoln-Oakes Nursery, Bismarck, ND		04				5	100	4	1.2	3.2	berries on 4
					06				5	100	3	2.6	3.4	
					08				5	100	3	3.1	2.8	all female
1A/6/1-5	9082678	AMCA6	leadplant	02	02		PLBR	5	5	100	2	0.6	1.0	
			<i>Amorpha canescens</i>		03				5	100		1.4	1.3	
			Lincoln-Oakes Nursery, Bismarck, ND		04				5	100	4	1.5	1.3	
					06				5	100	3	1.9	2.2	
					08				5	100	3	3.0	2.2	
1A/6/6-10	9091971	PHME13	black chokeberry	12-May	05	05		5	5	100	3	1.5	2.1	
			<i>Photinia melanocarpa</i>		06			5	100	2	2.1	2.4		
			Bailey Nurseries, Inc.		07			5	100	3	3.2	2.7		
					09			5	100	3	4.3	3.6	sprouts from layering	
1A/6/11-15	9008183	PRVI	common chokecherry	12-May	05	05		5	5	100	3	0.8	1.8	
			<i>Prunus virginiana</i>		06			5	100	5	1.5	2.6		
			Lincoln-Oakes Nursery, Bismarck, ND		07			5	100	3	2.2	3.8	1,5 yellow leaves; 3 powdery mildew	
			Sheridan County, ND		09			5	100	4	4.5	5.5	tent caterpillars on 1	
1A/7/1-5	9082706	ROAR3	prairie rose	03	03			5	5	100	4	1.2	1.2	
			<i>Rosa arkansana</i>		04				5	100	6	0.7	0.6	
			Bismarck, ND		05			3	60	5	2.3	1.3		
			Lincoln-Oakes Nursery, Bismarck, ND		07			3	60	3	2.3	1.3		
					09			3	60	5	2.6	1.4		
1A/7/6-10	9082746	RIMI	Missouri gooseberry	03	03		PLBR	5	5	100	6	1.4	1.4	
			<i>Ribes missouriense</i>		04				5	100	5	1.4	1.6	
			Big Sioux River, Watertown, SD		05			5	100		2.5	2.0		
			Big Sioux Nursery, Watertown, SD		07			5	100	7	1.9	1.7	severe leaf spot on all	
1A/7/11-15	9091967	PRPE2	pin cherry	12-May	05	05		5	5	100	3	1.5	2.2	
			<i>Prunus pensylvanica</i>		06			5	100	4	2.5	3.1		
			Big Sioux Nursery, Watertown, SD		07			5	100	3	4.2	3.8		
					09			5	100	5	6.9	6.3		

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											COV	PLT			
											VI	(ft)	HT		
1A/7/16-20	'Freedom'	LOKO2	blueleaf honeysuckle <i>Lonicera korolkowii</i> Lincoln-Oakes Nursery, Bismarck, ND	03	03		PLBR	5	5	100	4	2.2	2.2		
											3	4.7	4.0		
											2	5.5	4.9		clean leaves, no disease
											2	9.3	8.1		
1A/8/1-5	9082889	PIMU80	Mugo pine <i>Pinus mugo</i> Big Sioux Nursery, Watertown, SD	12-May	04	04	PLBR	5	5					no measurements taken	
											4	0.4	0.4		
											4	0.9	0.7		
											4	1.8	1.4		
			4	80	3	2.9	2.8								
1A/8/6-10	9082887	HIRH80	seaberry <i>Hippophae rhamnoides</i> Lincoln-Oakes Nursery, Bismarck, ND	20-May	04	04	PLBR	5	5	100	4	0.6	1.6		
											4	1.1	1.6		
											4	1.5	1.9		
											3	3.1	3.1		
											3	4.5	3.8		
1A/8/11-15	9082642	VILA	wayfaring bush <i>Viburnum lantana</i> Lincoln-Oakes Nursery, Bismarck, ND	20-May	04	04	PLBR	5	5	100	5	0.9	1.3		
											5	0.8	1.2		
											4	0.8	1.2		winter injury on 4,5
											5	1.3	1.4		sun scald, chlorosis on all
											6	1.9	2.4		stressed, yellow leaf margins
1A/8/16-20	9076686	CRCH	roundleaf hawthorn <i>Crataegus chrysocarpa</i> Lincoln-Oakes Nursery, Bismarck, ND	20-May	04	04	PLBR	5	4	80	4	0.6	0.7		
											4	0.8	0.9		
											5	1.0	1.4		cedar apple rust on all, wooly aphids 3
											5	1.7	2.2		powdery mildew
											5	2.6	2.9		heavy rust
1A/9/1-5	9082891	PHOP	common ninebark <i>Physocarpus opulifolius</i> Big Sioux Nursery, Watertown, SD	20-May	04	04	PLBR	5	5	100	3	1.3	1.6		
											4	2.5	1.9		
											3	4.6	3.2		
											2	5.9	6.0		
											2	7.0	7.0		

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1A/9/6-10	9082888	COAM3	American hazelnut <i>Corylus americana</i> Lincoln-Oakes Nursery, Bismarck, ND	20-May	04	04	PLBR	5	4	80	4	0.7	1.1	
						05			5	100	4	1.0	1.5	
						06			5	100	3	1.6	1.7	
						08			5	100		3.3	2.9	all browsed
						10			5	100	2	3.0	4.0	
IA/9/11-15	'Prairie Red' 9047203	PRUNU	hybrid plum <i>Prunus</i> sp. Big Sioux Nursery, Watertown, SD	4-May	06	06	PLBR	5	5	100	3	0.8	1.6	
						07			5	100	3	1.0	1.8	
						08			5	100	3	1.4	1.9	all browsed
						10			5	100	5	2.2	3.0	
IA/9/16-20	9092053	RHTY	staghorn sumac <i>Rhus typhina</i> Lincoln-Oakes Nursery, Bismarck, ND	4-May	06	06	PLBR	5	5	100	2	3.9	3.9	
						07			5	100	4	4.5	5.1	
						08			5	100	4	5.3	4.4	deer rub on 2
IA/10/1-5	9092143 Tiger Eyes	RHTY	staghorn sumac <i>Rhus typhina</i> S&B Nursery, Bismarck, ND (Bailey's, St. Paul, MN)	May	07	07		5	1	20	3	1.5	1.0	
						08			5	100	3	0.9	1.2	
						09			4	80	3	1.6	1.8	
1A/10/6-10	9092141	VILE	nannyberry <i>Viburnum lentago</i> Schumacher's Nursery, Heron Lake, MN	May	07	07		5	5	100	3	0.5	1.6	2,3,5 powdery mildew
						08			5	100	3	1.2	1.7	
						09			5	100	4	0.8	1.8	powdery mildew on all
IA/10/11-15	Sun Harvest Germplasm 9083247	COAM3	American hazelnut <i>Coylus americana</i> USDA, NRCS, PMC, Elsberry, MO	May	07	07		5	3	60	4	0.4	1.8	
						08			5	100	4	0.7	1.6	all browsed
						09			5	100	5	2.1	1.7	
IA/10/16-20	Midwest Premium Germplasm 9083241	PRAM	American plum <i>Prunus americana</i> USDA, NRCS, PMC, Elsberry, MO	May	07	07		5	3	60	4	0.4	1.3	
						08			3	60	6	0.3	1.0	
						09			4	80	5	0.8	1.1	deer browse on all
IA/11/1-5	9082895	PRAR3	apricot <i>Prunus armeniaca</i> Rod O'Clair, Jamestown, ND USDA, NRCS, PMC, Bismarck, ND	May	07	07		5	3	60	4	0.9	1.0	
						08			3	60	4	1.8	2.6	
						09			3	60	5	3.8	4.5	

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IA/11/6-10	9091969	CAFR80	Russian peashrub <i>Caragana frutex</i> Big Sioux Nursery, Watertown, SD	May 07	07			5	5	100	4	0.3	1.4	
					08				5	100	5	0.4	1.4	
					09				5	100	4	0.6	1.5	
IA/11/11-15	9091964	RHTR	skunkbush sumac <i>Rhus trilobata</i> Cave Hills, SD USDA, NRCS, PMC, Bismarck, ND	May 07	07			5	5	100	2	0.9	1.8	
					08				5	100	4	2.7	2.0	chlorosis
					09				5	100	4	3.8	2.4	
IA/11/16-20	9091967	PRPE2	pin cherry <i>Prunus pensylvanica</i> Big Sioux Nursery, Watertown, SD	8-May	08			5	5	100	4	0.4	1.7	all browsed
					09				4	80	4	0.8	1.6	
					10				4	80	5	1.6	2.1	
II/1/1-5	'Roselow' PI-477986	MASA9	Sargent crabapple <i>Malus sargentii</i> USDA, NRCS, PMC, East Lansing, MI Lincoln-Oakes Nursery, Bismarck, ND	1-May	96	96	PLBR	5	4	80	4	1.4	2.0	browse on 4
					97				4	80	2	2.0	2.3	
					98				4	80	3	3.5	3.4	
					00				4	80	3	6.7	5.5	
					02				4	80	3	7.1	6.9	no leaf diseases
					05				4	80	3	6.0	8.1	
					10				4	80	4	14.3	7.9	
II/1/6-10	'Midwest' 478000	MAMA37	Manchurian crabapple <i>Malus mandshurica</i> USDA, NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	1-May	96	96	PLBR	5	5	100	3	1.6	2.5	browse on 1,3
					97				5	100	2	3.4	3.6	
					98				5	100	1	5.0	6.4	
					00				5	100	3	7.8	9.1	
					02				5	100	2	9.0	10.2	
					05				5	100	3	9.8	13.3	
					10				5	100	5	12.8	11.5	
II/2/1-5	9030971	ACGI	amur maple <i>Acer ginnala</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May	96	96	PLBR	5	5	100	3	1.1	1.8	
					97				5	100	2	1.6	1.9	
					98				5	100	2	3.1	4.1	
					00				5	100	4	7.9	7.0	
					02				5	100	3	9.2	8.1	
					05				5	100	3	10.0	13.9	
					10				5	100	4	13.4	9.9	

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II/1/6-10	'Schubert' 9012608	PRVI	chokecherry <i>Prunus virginiana</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96		PLBR	5	5	100	4	0.7	2.1	
					97				5	100	1	1.5	2.6	
					98				5	100	1	2.4	3.5	
					00				5	100	2	5.8	6.5	
					02				5	100	2	8.1	9.0	
					05				5	100	2	10.0	11.8	
					10				5	100	3	10.4	13.0	
II/3/1-5	9047209	PRVI	chokecherry <i>Prunus virginiana</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96		PLBR	5	5	100	3	0.7	2.0	
					97				5	100	3	1.5	3.5	insect damage on 4
					98				5	100	1	2.5	5.3	some suckers on 3,4
					00				5	100	4	6.8	8.1	
					02				5	100	3	9.1	10.8	
					05				5	100	3	12.0	13.2	yellow fruit on 1
					10				5	100	4	13.8	14.1	fungus on 3
II/3/6-10	ND-1733 9006060	PRAM	plum <i>Prunus americana</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96		PLBR	5	5	100	3	1.3	2.4	
					97				5	100	3	2.8	3.4	insect, disease damage
					98				5	100	3	4.0	6.3	
					00				5	100	3	10.7	9.0	
					02				5	100	2	11.4	10.5	
					05				5	100	4	9.9	11.9	
					10				5	100	5	10.8	9.9	
II/4/1-5	Prairie Harvest Germplasm 9034956	CEOC	hackberry <i>Celtis occidentalis</i> Polk County, MN USDA, NRCS, PMC, Bismarck, ND	7-May 09	09			5	5	100	3	0.4	1.1	
					10				5	100	5	0.5	0.7	
II/4/6-10	Oahe	CEOC	hackberry <i>Celtis occidentalis</i> Big Sioux Nursery, Watertown, SD	7-May 09	09			5	5	100	3	0.5	1.7	
					10				5	100	5	0.4	1.1	

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II/5/1-5	'McDermand' 478004	PYUS	Ussurian pear <i>Pyrus ussuriensis</i> NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	PLBR		5	5	100	3	1.0	2.5	browse on 1
					97				5	100	3	2.4	3.3	leaf damage
					98				5	100	2	2.9	5.2	
					00				5	100	3	7.3	9.4	
					02				5	100	3	10.0	11.8	
					05				5	100	4	12.0	13.6	
					10				5	100	3	16.8	16.0	
II/5/6-10	9076733	VILE	nannyberry <i>Viburnum lentago</i> Turtle Mountains, ND Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	PLBR		5	5	100	5	0.3	0.7	
					97				5	100	5	0.8	1.3	
					98				5	100	3	1.3	2.9	mildew on leaves
					00				5	100	4	3.9	4.7	
					02				5	100	5	4.4	5.4	
					05				5	100	4	3.8	5.8	red color on 3-5
					10				5	100	7	3.2	4.9	
II/6/1-5	'Homestead' 9005731	CRAN6	Arnold hawthorn <i>Crataegus X anomala</i> NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	PLBR		5	5	100	5	0.5	1.5	browse on 3,5
					97				4	80	7	0.4	1.4	
					98				4	80	8	0.3	1.4	severe rabbit damage - all
					00				4	80	7	1.2	1.6	
					02				4	80	6	2.2	2.5	
					05				2	40	6	1.8	3.0	
					10				1	20	7	1.0	3.0	
II/6/6-10	9069121	PRPA5	mayday <i>Prunus padus</i> Norway USDA, NRCS, PMC, Bismarck, ND	1-May 96	96	PLBR		5	5	100	5	0.4	0.6	browse on 4,5
					97				5	100	4	1.1	1.7	
					98				5	100	3	1.6	3.2	insect damage on 3,4
					00				5	100	3	3.7	6.1	
					02				5	100	3	5.4	9.2	
					05				5	100	4	5.7	10.3	
					10				4	80	6	5.8	7.6	

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II/7/1-5	9069129	PRMA9	amur chokecherry <i>Prunus maackii</i>	1-May 96	96	CONT(P)		5	5	100	1	2.2	4.1	
			Big Sioux Nursery, Watertown, SD		97				5	100	1	4.4	5.6	
			USDA, NRCS, PMC, Bismarck, ND		98				5	100	1	6.3	8.6	moderate deer rub
					00				5	100	2	10.6	11.5	
					02				5	100	3	13.2	12.4	
					05				5	100	4	11.5	11.9	3 is mostly dead
					10				4	80	6	15.8	12.9	
II/7/6-10	9082666	BETUL	Asian black birch <i>Betula davurica</i>	16-May 01	01	CONT		5	5	100	3	1.0	1.3	
			Lawyer Nursery, Plains, MT		02				5	100	3	2.3	2.9	
					03				5	100	3	3.2	5.4	
					05				5	100	4	4.0	7.9	1 is browsed
					07				5	100	4	5.8	9.7	
					10				5	100	4	4.0	7.9	
II/8/1-5	9092052	QUBI	swamp white oak <i>Quercus bicolor</i>	4-May 06	06	PLBR		5	4	80	3	0.6	1.2	5 chewed off
			Lincoln-Oakes Nursery, Bismarck, ND		07				4	80	3	0.8	1.3	
					08				4	80	4	1.1	1.3	
II/8/6-10	9082675	FRMA5	Manchurian ash <i>Fraxinus mandshurica</i>	3-May 00	00	PLBR		5	5	100	2	0.8	2.2	
			Lincoln-Oakes Nursery, Bismarck, ND		01				5	100	4	1.2	2.3	
					02				5	100	4	2.0	4.0	
					04				5	100	5	1.9	5.7	
					06				5	100	5	2.6	6.4	
					09				5	100	6	2.2	6.3	
II/9/1-5	9082667	BEPO	gray birch <i>Betula populifera</i>	3-May 00	00	PLBR		5	5	100	2	1.3	3.6	
			Lawyer Nursery, Plains, MT		01				5	100		3.7	6.4	
					02				5	100	2	5.4	9.8	
					04				5	100	3	8.1	14.5	
					06				5	100	3	9.6	16.4	drought stress
					09				5	100	3	10.6	19.0	
II/9/6-10	9092051	CASP8	northern catalpa <i>Catalpa speciosa</i>	4-May 06	06	PLBR		5	5	100	3	0.6	0.8	
			Big Sioux Nursery, Watertown, SD		07				4	80	3	0.8	1.0	
					08				4	80	4	4.0	1.6	
					10				4	80	3	2.0	2.8	

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III/1/1-5	9076739	QUERC	oak hybrid <i>Quercus</i> E.T. Jacobson, MN USDA, NRCS, PMC, Bismarck, ND	30-Apr 98	98	CONT(P)	5	5	100	4	0.6	1.7		
										6	1.2	2.4	browse on 4	
										3	2.4	3.9		
										5	3.9	6.2		
										6	4.5	7.3	acorns on 3	
4	6.6	8.3												
III/1/6-10	9069177	QUMA2	bur oak <i>Quercus macrocarpa</i> E.T. Jacobson, MN USDA, NRCS, PMC, Bismarck, ND	30-Apr 98	98	CONT(P)	5	5	100	6	0.5	1.0	browse on 3	
									80	6	0.8	1.2		
									100	5	1.4	1.7		
									100	5	3.9	4.8		
									100	5	3.2	5.4	stem gall on 5	
5	4.7	6.6												
III/2/1-5	'Oahe' 476982	CEOC	hackberry <i>Celtis occidentalis</i> NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	PLBR	5	5	100	5	1.0	2.7		
									100	5	1.7	2.7	4 browsed	
									100	5	2.1	3.7		
									100	4	6.6	8.1		
									100	4	7.9	11.7		
5	100	4	7.6	13.4										
5	100	4	7.0	17.5										
III/2/6-10	9019578	CEOC	hackberry <i>Celtis occidentalis</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	PLBR	5	5	100	6	0.5	1.7	browse on 2,3,5	
									100	6	1.7	2.8	browse on 3,4,5	
									100	4	2.5	3.9		
									100	4	6.2	7.1		
									100	4	10.3	13.2	leaf gall	
5	100	4	10.4	14.7										
5	100	4	11.5	21.0										
III/3/1-5	'Cardan' 469226	FRPE	green ash <i>Fraxinus pennsylvanica</i> NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	PLBR	5	4	80	5	0.4	1.6		
									100	3	1.4	2.2		
									100	4	3.0	4.1		
									100	4	7.6	8.1		
									100	4	9.4	12.4		
5	100	4	10.2	14.9										
5	100	3	9.8	22.6										

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<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>				
III/3/6-10	9019586	FRPE	green ash	1-May	96	96	PLBR	5	5	100	3	1.0	2.6	2 browsed				
			<i>Fraxinus pennsylvanica</i>									97	5		100	3	2.8	3.7
			Lincoln-Oakes Nursery, Bismarck, ND									98	5		100	3	5.3	6.7
												00	5		100	3	9.3	11.2
												02	5		100	3	11.5	14.9
												04	5		100	3	10.4	17.1
												05	5		100	3	12.4	18.3
III/4/1-5	9063115	FRPE	green ash	1-May	96	96	CONT(P)	5	5	100	5	0.2	0.9	browse on 1,2,3,5 leaf damage on 2				
			<i>Fraxinus pennsylvanica</i>									97	5		100	3	1.0	2.0
			Itasca State Park, MN									98	5		100	4	2.3	3.9
			USDA, NRCS, PMC, Bismarck, ND									00	5		100	3	6.3	7.5
												02	5		100	4	9.2	13.8
												05	5		100	4	9.1	17.1
												10	5		100	3	14.2	27.0
III/4/6-10	9063116	FRNI	black ash	1-May	96	96	CONT(P)	5	5	100	5	0.3	1.3	browse on 2 browse on 1 leaves yellowing-stress				
			<i>Fraxinus nigra</i>									97	2		40	7	0.7	1.0
			Itasca State Park, MN									98	2		40	6	1.5	2.3
			USDA, NRCS, PMC, Bismarck, ND									00	2		40	4	2.4	5.4
												02	2		40	5	4.2	8.6
												05	2		40	6	4.1	9.9
												10	2		40	6	5.0	9.0
III/5/1-5	9063127	FRAM2	white ash	1-May	96	96	PLBR	5	5	100	5	0.2	1.4	slight insect damage on 2				
			<i>Fraxinus americana</i>									97	5		100	4	1.6	2.3
			Wisconsin									98	5		100	4	2.1	3.8
			Lincoln-Oakes Nursery, Bismarck, ND									00	5		100	5	4.5	8.9
												02	5		100	4	7.6	12.9
												05	5		100	4	7.3	14.9
												10	5		100	3	7.2	20.8

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III/5/6-10	9076730	ACSA2	silver maple	1-May	96		PLBR	5	5	100	3	1.2	3.1	
			<i>Acer saccharinum</i>		97				5	100	1	3.8	5.2	
			Lincoln-Oakes Nursery, Bismarck, ND		98				5	100	3	8.7	9.5	
					00				5	100	3	14.2	15.7	
					02				5	100	4	13.3	16.9	
					05				5	100	4	12.9	19.0	broke off stump sprout on 2
					10				5	100	4	14.4	19.3	2 very small, few weak leaves
III/6/1-5	Hunter Germplasm 9081843	PIPOS	ponderosa pine	12-May	05			5	5	100	2	0.6	1.2	
			<i>Pinus ponderosa</i> var. <i>scopulorum</i>		06				5	100	2	1.2	1.6	
			USDA, ARS, Bridger, MT		07				5	100	2	2.1	2.5	
					09				5	100		4.1	4.6	
III/6/6-10	9063148	PHAM2	amur corktree	1-May	96		CONT(P)	5	5	100	5	0.4	1.2	browse on 5
			<i>Phellodendron amurense</i>		97				5	100	3	2.8	2.6	
			Clay County, MN		98				5	100	3	4.9	4.8	
			USDA, NRCS, PMC, Bismarck, ND		00				5	100	3	8.5	6.8	
					02				5	100	3	10.4	8.7	
					05				5	100	4	10.5	9.9	tractor damage on trunk of 5
					10				5	100	3	11.8	11.1	
III/7/1-5	9069178	PIRE	red pine	29-Apr	99			5	5	100	4	1.0	1.3	
			<i>Pinus resinosa</i>		00				5	100	4	1.0	1.3	
			USDA, NRCS, PMC, Bismarck, ND		01				5	100	3	2.9	3.0	
					03				5	100	3	4.7	5.4	
					05				5	100	2	6.2	8.5	
					08				5	100	3	3.0	3.5	
III/7/6-10	9076731	QUMA2	bur oak	1-May	96		PLBR	5	5	100	5	0.2	1.3	browse on 1,2
			<i>Quercus macrocarpa</i>		97				4	80	6	0.8	1.3	
			Black Hills, SD		98				4	80	5	1.6	2.1	mod-severe rabbit damage
					00				4	80	4	2.6	4.3	
					02				4	80	5	4.3	6.5	leaf spot
					05				4	80	5	4.8	6.9	acorns, leaf spot on all, dieback 5
					10				4	80	5	6.6	9.1	

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<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
III/8/1-5	9076735	AEGL	Ohio buckeye <i>Aesculus glabra</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	PLBR		5	5	100	4	0.2	0.6	
									5	100	8	0.7	0.6	
									5	100	6	0.7	1.0	
									5	100	4	1.6	1.5	
									5	100	6	1.9	1.8	
									5	100	6	1.0	1.4	leaf burns/dieback on all
							3	60	8	1.5	1.2			
III/8/6-10	9076737	PRSE2	black cherry <i>Prunus serotina</i> Apple Valley FEP Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	PLBR		5	4	80	3	1.0	1.9	
									4	80	4	1.9	2.2	
									4	80	3	4.3	5.0	
									4	80	3	8.7	10.1	
									4	80	3	11.1	12.9	
									4	80	4	10.8	15.1	
							4	80	3	10.0	17.3			
III/9/1-5	9082609	PICEA	Meyer's spruce <i>Picea meyeri</i> Itasca Greenhouse, Cohasset, MN	16-May 01	01	CONT		5	3	60	5	0.8	0.7	
									3	60		1.0	0.9	
									3	60		1.2	1.1	
									3	60	3	1.6	1.4	
									3	60	5	2.2	1.6	
									3	60	1	3.0	2.0	
III/9/6-10	9092236	POTR5	aspen <i>Populus tremuloides</i> Big Sioux Nursery, Watertown, SD	8-May 08	08			5	1	20	4	0.5	1.8	
									1	20	6	1.0	1.8	
									0	0				
III/9/6-10	9094335	TICO	littleleaf linden <i>Tilia cordata</i> Big Sioux Nursery, Watertown, SD	4-May 10	10	PLBR		5	5	100	8	0.5	0.9	
III/10/1-5	9082885	POTR5	aspen <i>Populus tremuloides</i> NDFS Nursery, Towner, ND	20-May 04	04	PLBR		5	3	60	4	0.7	2.1	
									4	80	5	1.1	1.9	
									5	100		1.4	2.2	
									5	100	4	1.8	2.2	
									5	100	4	2.4	1.6	

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III/10/6-10	9082633	FRNI	black ash <i>Fraxinus nigra</i> Lawyer Nursery, Plains, MT	29-Apr 99	99			5	5	100	6	0.3	0.7	browse on 4
					00				4	80	4	0.9	1.0	
					01				4	80	4	1.0	2.1	
					03				4	80	4	1.1	3.2	
					05				4	80	5	1.7	3.5	
					08				4	80	4	1.1	3.2	
III/11/1-5	ND-686 478008	SYPE	Pekin lilac <i>Syringa pekinensis</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96		PLBR	5	5	100	3	2.3	2.9	
					97				4	80	5	2.4	2.3	winter damage
					98				4	80	3	4.6	3.7	
					00				4	80	4	6.9	5.9	
					02				4	80		8.1	6.9	
					05				4	80	6	7.0	6.9	
					10				4	80	4	7.8	6.9	fungus on 3
III/11/6-10	9076725	ULCA	smooth bark elm <i>Ulmus carpinifolia</i> Russia USDA, ARS, Mandan, ND	1-May 96	96		PLBR	5	5	100	3	2.6	3.1	
					97				5	100	6	3.5	3.6	sev. rabbit damage 1,3,4,5
					98				5	100	3	5.1	5.6	rabbit damage on trunk 3,4
					00				5	100	4	9.0	9.1	
					02				5	100	4	12.5	13.9	
					05				5	100	4	11.4	17.2	
					10				0	0				
III/11/6-10	9094336	ACFR	Freeman maple <i>Acer X freemanii</i> Big Sioux Nursery, Watertown, SD	4-May 10	10		PLBR	5	3	60	8	0.5	1.2	
III/12/1-5	9082886	POTR5	aspen <i>Populus tremuloides</i> Lincoln-Oakes Nursery, Bismarck, ND	20-May 04	04		PLBR	5	5	100	4	0.8	2.0	
					05				5	100	5	1.1	2.2	
					06				4	80		1.9	2.3	
					08				3	60	4	1.6	2.3	
					10				0	0				
III/12/1-5	9094334	TIAM	American linden <i>Tilia americana</i> Big Sioux Nursery, Watertown, SD	4-May 10	10		PLBR	5	5	100	5	0.7	1.5	

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											COV <u>VI</u>	PLT <u>(ft)</u>				
III/13/1-5	9082639	QUEL	northern pin oak <i>Quercus ellipsoidalis</i> Lincoln-Oakes Nursery, Bismarck, ND	29-Apr 99	99	PLBR		5	2	40	8	0.3	0.5			
											6	1.1	0.9			
											6	1.0	2.5			
											4	2.4	4.1			
											?	2.3	5.6		leaf galls, army worms/galls	
4	4.3	7.9														
III/14/1-5	9082739	OSVI	ironwood <i>Ostrya virginiana</i> Sertoma Park, Bismarck, ND USDA, NRCS, PMC, Bismarck, ND	May 07	07			5	2	40	4	0.9	2.1	deer browse, chlorosis on 1		
											5	100	6		0.4	1.0
											5	100	6		0.7	1.1
III/14/6-10	9092231	PICOL	lodgepole pine <i>Pinus contorta</i> var. <i>latifolia</i>	7-May 09	09			5	5	100	4	0.5	1.1	needle burn on 4		
											5	100	1		0.9	1.5
IV/1/1-5	9082610	LASI	Siberian larch <i>Larix sibirica</i> NDFS Nursery, Towner, ND	30-Apr 98	98	CONT(S)		5	5	100	4	0.5	1.0			
											5	100	6		0.8	1.5
											5	100	5		1.3	2.1
											5	100	4		3.1	5.0
											5	100	5		3.9	6.9
5	100	3	6.5	11.2												
IV/1/6-10	9082611	LASI	Siberian larch <i>Larix sibirica</i> NDFS Nursery, Towner, ND	30-Apr 98	98	CONT(S)		5	5	100	3	0.5	1.2			
											5	100	6		0.7	1.4
											5	100	5		1.0	1.6
											5	100	5		1.8	2.7
											5	100	5		2.4	3.7
5	100	5	3.9	6.6												
IV/2/1-5	9069168	LASI	Siberian larch <i>Larix sibirica</i> Russia USDA, NRCS, PMC, Bismarck, ND	30-Apr 98	98	CONT(P)		5	1	20	4	0.3	1.3			
											4	80	6		0.7	1.4
											4	80	5		1.1	1.9
											4	80	4		2.6	4.0
											4	80	4		3.2	6.6
4	80	2	6.8	11.9												

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IV/2/6-10	9069162	LARIX	Dahurian larch	30-Apr	98		CONT(P)	5	3	60	3	0.9	1.7	
			<i>Larix olgensis</i>		99				4	80	4	2.1	2.2	
			China		00				5	100	4	2.9	3.6	
			USDA, NRCS, PMC, Bismarck, ND		02				5	100	3	5.4	5.9	
					04				5	100	3	7.0	8.1	chlorotic, no leader on 4
		07				5	100	3	9.6	11.0	3 top dieback, deer damage 4			
IV/3/1-5	9069163	LARIX	Dahurian larch	30-Apr	98		CONT(P)	5	0	0				
			<i>Larix olgensis</i>		99				1	20	5	1.0	2.0	
			China		00				4	80	5	1.3	2.0	
			USDA, NRCS, PMC, Bismarck, ND		02				4	80	5	2.6	3.8	
					04				4	80	6	4.2	6.8	
		07				3	60	3	9.2	13.8				
IV/3/6-10	9069164	PISYM	Scots pine	30-Apr	98		CONT(P)	5	2	40	4	0.6	1.0	
			<i>Pinus sylvestris</i> var. <i>mongolica</i>		99				5	100	4	1.3	1.8	
			China		00				5	100	3	2.4	2.7	
			USDA, NRCS, PMC, Bismarck, ND		02				5	100	3	5.2	6.2	
					04				5	100	3	7.9	10.9	
		07				5	100	3	14.5	16.3				
IV/4/1-5	9069172	PISY	Scots pine	30-Apr	98		CONT(P)	5	0	0				
			<i>Pinus sylvestris</i>		99				5	100	3	1.4	2.1	
			Russia		00				5	100	3	2.2	2.9	
			USDA, NRCS, PMC, Bismarck, ND		02				5	100	3	5.1	6.2	
					04				5	100	3	7.7	10.9	
		07				2	40	3	13.0	13.6				



2010 Report Off-Center Evaluation Planting of Woody Plant Materials Becker, Minnesota

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INTRODUCTION

The Plant Materials Center (PMC), located at Bismarck, North Dakota, was established in 1954 as part of the U.S. Department of Agriculture's Soil Conservation Service, now the Natural Resources Conservation Service (NRCS). The Bismarck PMC serves the States of Minnesota, North Dakota, and South Dakota. Tree and shrub improvement has always been an integral part of the plant materials program in Minnesota. There is a need to evaluate how different trees and shrubs will perform in diverse soil and climatic conditions. The PMC currently has tree and shrub evaluation sites at five locations in the three-state area, including two sites in Minnesota.

A long-term agreement, effective through August 9, 2010, has been developed with the University of Minnesota, Becker Research Farm, and the Anoka Sand Plain Association of Soil and Water Conservation Districts (SWCD). In 2010, the name was changed to the Plant Materials Learning Center consisting of representatives from Benton, Sherburne, Stearns, and Wright Soil and Water Conservation Districts. The Major Land Resource Area is 91, Wisconsin and Minnesota Sandy Outwash. Soils are a Hubbard-Mosford complex with leached coarse and medium sand outwash. Long-term average rainfall is 30.55 inches. The site is located on the north side of the Becker Research Farm, adjacent to the railroad tracks. A sign and kiosk are located on site. The first trees and shrubs were planted in 1996. The plots have been maintained with cultivation until 2003 when a 50/50 mix of Bad River ecotype blue grama and 'Pierre' sideoats grama was seeded between the rows of Block I (Shrubs) and Block II (Medium Tall Trees). The rest of the area was seeded in the fall of 2008 to a mixture of low-maintenance fine fescues. A rotary-head tree cultivator was purchased in 2010 for within row weed control. Rainfall conditions in 2010 were good. April was about an inch above normal. May was average. June was two times average, as was September. July and August were near normal. New entries planted each year are flagged and hand watered. Weed control is mechanical cultivation between rows, and hand hoeing and rotary cultivation. The seeded area is mowed. Wire cages are installed on entries with potential for deer and rabbit browsing. Measurements and notes are taken near the end of each growing season.

OBJECTIVIES

5. Assemble and evaluate the adaptation and performance of selected woody plant materials for field and farmstead windbreaks, wildlife habitat, and streambank and lakeshore plantings in the Upper Midwest.
2. Select and cooperatively release superior woody conservation plants for increase by commercial nurseries.



A rotary-head tree cultivator was used for the first time this year for within-row weed control.

ACTIVITIES IN 2010

Approximately 115 accessions of 91 different species are currently being evaluated. Four accessions were added to the planting on May 5, 2010. They included common elderberry (*Sambucus nigra* ssp. *canadensis*), littleleaf linden (*Tilia cordata*), American linden (*Tilia americana*), and Freeman maple (*Acer x freemanii*). All plants were bareroot seedlings received from Big Sioux Nursery, Watertown, South Dakota. No replacements were made for non-surviving plants from accessions planted in previous years. Weed control and plot maintenance been consistently good. The short stature blue grama/sideoats grama cover between the tree rows in Blocks I and II is mowed occasionally during the growing season. The stand continues to become denser over time, although the drill rows are still readily visible. The new planting of fescue seeded in the fall of 2008 between the tree rows had an excellent stand. A small plot of 'Tatanka' buffalograss was seeded in 2000 on the south end of the native grass plots. It also established slowly but is now a good stand and is spreading by stolons. Entries planted for demonstration in 2002 in Block 1A include Red River germplasm prairie cordgrass, 9082679 slough sedge, 9063128 sweetgrass, and 9082714 cup plant. All are doing well. The sweetgrass especially has spread by rhizomes and completely filled in the row.

Removal and pruning of natural die-back of some species (primarily shrubs), and cutting and removal of contaminant species and poor performing entries is done on a routine basis. Two entries were removed because of poor performance in 2010. These included two accessions (9082886, 9092236) of aspen (*Populus tremuloides*) planted in 2004, and 2008, respectively. Information was collected on selected entries on August 18, 2010. Measurements and notes were taken on crown spread and plant height, disease and insect damage, drought and cold tolerance, fruit production, survival, vigor, and animal damage. Entries noted to be performing poorly included redosier dogwood, sand cherry, Russian almond, and Pekin cotoneaster. Many of the shrub species are getting towards the end of their life-span. Some of the entries noted to be in high vigor and doing well included rugosa rose, American black currant, common ninebark, winterberry, 'Freedom' honeysuckle, black chokeberry, green ash species, hackberry species, black cherry, and most of the conifer species. Sixty-seven accessions/entries were measured in 2010.

Data is summarized annually and documented in the Bismarck PMC Technical Report. Anyone who desires a copy of the latest data summary information can contact Dwight Tober at (701) 530-2075 or Dwight.Tober@nd.usda.gov. The report is about 25 pages in length.



Many of the newer shrubs, such as this cutleaf staghorn sumac, are performing well.

NEW RELEASES

Data collected from this site was used to support the formal release of two new shrubs in 2005 cooperatively with the Minnesota Agricultural Experiment Station (MAES). Silver Sands germplasm sandbar willow and Survivor germplasm false indigo were planted in 1996. They both had 100 percent survival (with replacements) and good to excellent vigor and overall plant performance ratings. Rabbits did browse the sandbar willow quite extensively the first two

years. Both species are subject to natural die-back due to winter or drought conditions. A release brochure was completed in 2006 and is available on the Bismarck PMC homepage (<http://Plant-Materials.nrcs.usda.gov>) for these two new releases, or it can be ordered from the Bismarck PMC. 'Prairie Red' hybrid plum was released as a formal cultivar in 2006. It is known for a high percentage of large, sweet fruit and less suckering than the American plum. It was planted at the Becker site in 2006. Prairie Red was also cooperatively released with MAES. 'McKenzie' black chokeberry was officially released as a cultivar in 2008 with numerous partners, including MAES. It has done well at this site and is being compared with 'Viking', 'Nero' and a Bailey Nurseries selection. Black chokeberry is currently a high interest fruit species primarily because of the quantity and quality of fruit it produces. It is considered one of the healthier foods on the market because of the high content of antioxidants and vitamins in the berries. It is also gaining a reputation for making excellent juice, jelly, and wine. Riverview germplasm American black currant was released in 2010. It is a native shrub originating from northeastern South Dakota. It is performing well here. It is not recommended for planting near white pine because it is considered an alternate host plant for the fungus that causes white pine blister rust. A new PMC release, Prairie Harvest germplasm hackberry from Polk County, Minnesota, has not been evaluated at this site. It was planted in 2009 with 'Oahe' hackberry for comparison.

SUMMARY OF ACCOMPLISHMENTS

Selected accessions/cultivars that have performed well at the Becker site and show promise for additional testing and/or promotion for conservation use include the following:

9019586 green ash	9082711 winterberry euonymus
'Centennial' cotoneaster	'Scarlet' Mongolian cherry
'McDermid' Ussurian pear	'Freedom' honeysuckle
'Indigo' silky dogwood	9082632 Mongolian peashrub
9082891 common ninebark	9082712 bittersweet
Silver Sands germplasm sandbar willow	9082687 American black currant
Schubert chokeberry	Survivor germplasm false indigo
9069162 Dahurian larch	9069129 Amur chokecherry
ND-170 cotoneaster	9082667 gray birch
9069168 Siberian larch	'McKenzie' black chokeberry
9082619 Siberian larch	'Midwest' Manchurian crabapple
9076730 silver maple	9069164 Scots pine
9063148 corktree	9076729 gray dogwood
9076737 black cherry	'Arnold's Red' honeysuckle
9057406 rugosa rose	9069172 Scots pine
9019605 sand cherry	9069163 Dahurian larch
9082888 American hazelnut	9069162 Dahurian larch
'Oahe' hackberry	

Data from this planting has been used to document the cooperative release of the cultivars listed below. These cultivars are generally available from local conservation nurseries and are used in conservation plantings throughout the Northern Great Plains and Upper Midwest. Several more releases are anticipated in the near future. Information gathered concerning plant performance

assists cooperating nurseryman and plant researchers in determining the range of adaptation of many other accessions/cultivars also included in the test planting.

Formal Releases with Supporting Documentation from the Becker Site

'Legacy' late lilac	1999
Silver Sands germplasm sandbar willow	2005
Survivor germplasm false indigo	2005
'Prairie Red' hybrid plum	2006
'McKenzie' black chokeberry	2008
Riverview germplasm American black currant	2010

ACKNOWLEDGMENTS

This research is sponsored and supported by the University of Minnesota, Becker Research Farm at Becker; the NRCS field office and Sherburne County SWCD at Elk River; the NRCS area office at Brooklyn Center; and the NRCS State office at St. Paul. Appreciation goes to the staff at the Becker Research Farm for the special attention to plot cultivation and maintenance, and staff at the Sherburne County SWCD for hand weeding, signage, and general plot maintenance and plot coordination.

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OFF-CENTER EVALUATION PLANTING: TECHNICAL REPORT 2010

Study NDPMC-T-0201-CP

Study Title: Eastern South Dakota Soil & Water Research Farm, Brookings, South Dakota

Purpose: The purpose of the farm is to find solutions to national and regional concerns related to soil and water conservation and the efficiency and sustainability of agricultural production. Research and technology transfer activities on the farm are conducted by a partnership including: USDA Agricultural Research Service, USDA Natural Resources Conservation Service, South Dakota State University, South Dakota Agricultural Experiment Station, the Brookings County Conservation District, as well as 14 other County Conservation Districts from eastern South Dakota.

History: The Eastern South Dakota Soil and Water Research Farm, Inc. is a non-profit organization consisting of a Board of Directors elected from each of 15 Soil and Water Conservation Districts in eastern South Dakota. Brookings, Codington, Clark, Day, Deuel, Hamlin, Kingsbury, Lake, Lincoln, Marshall, McCook, Minnehaha, Minor, Moody, and Turner Soil and Water Conservation Districts are represented on the Board of Directors. The purpose of the corporation is to promote research of efficient farm production practices that conserve soil and water resources.

The corporation purchased 100 acres of land in Lake County, South Dakota, near the community of Madison in 1959. This land was leased to the USDA Agricultural Research Service. The work performed at the Madison farm included evaluation of the erosion of different soil types, development of tillage practices to conserve soil and water, determination of efficient crop production methods, and modeling plant-insect interactions. Research was conducted by scientists from the North Central Soil and Water Conservation Laboratory, ARS, Morris, MN; the Northern Grain Insects Research Laboratory, ARS, Brookings, SD; and the South Dakota State Agricultural Experiment Station.

In an effort to improve program efficiency and facilitate productive cooperative research programs that would more effectively solve some of the problems that are associated with agriculture in eastern South Dakota, the Board of Directors decided to relocate the research farm closer to the research laboratories. The Madison research farm was sold in 1987, and the Corporation purchased another tract of land in Brookings County.

The Brookings Research Farm consists of 80 acres located approximately one mile north of the campus of South Dakota State University. The soils on this farm are characteristic of those found in northeastern South Dakota and west central Minnesota and are similar to soils common to the northern Corn Belt. A new building was constructed in 2006. Some trees were removed during the construction.

Methods and Materials

Assembly: The first tree planting trials were started in 2000 when 16 species were planted. An additional six species were planted in 2001. These trials were used to showcase different types of tree species and various weed control methods. Currently, 38 accessions of 35 different species are being evaluated.

In 2004, the PMC staff became involved in planting additional tree and shrub accessions that will be evaluated on an annual basis. Refer to Table BR-2 for entries planted from 2004-2010.

For the 2010 weather summary at Brookings, see Table BR-1.

Planting Plan: The layout of the evaluation plots is shown in Figure BR-1 and Figure BR-2. The tree and shrub plots are in the northeastern area of the Research Farm.

Site Preparation: Strips to be planted are chemically killed with glyphosate, and then tree fabric is laid down.

Planting Method: All trees and shrubs are planted by hand, except those moved with a tree spade in 2008.

Weed Control/Plot Management:

Evaluations and Measurement: The plots were evaluated on August 19, 2010. Plant performance data is recorded during the growing season for the first three years. After the third year, data is gathered according to a specific schedule. Records of planting date, survival, vigor, fruit (seed) amount, canopy width, plant height, winter injury, disease symptoms, and insect damage are recorded. Select data appears in this report. Annual summary reports have been prepared since 2006 and can be requested from the PMC.

Figure BR-1.

2004 Research Farm Field Map

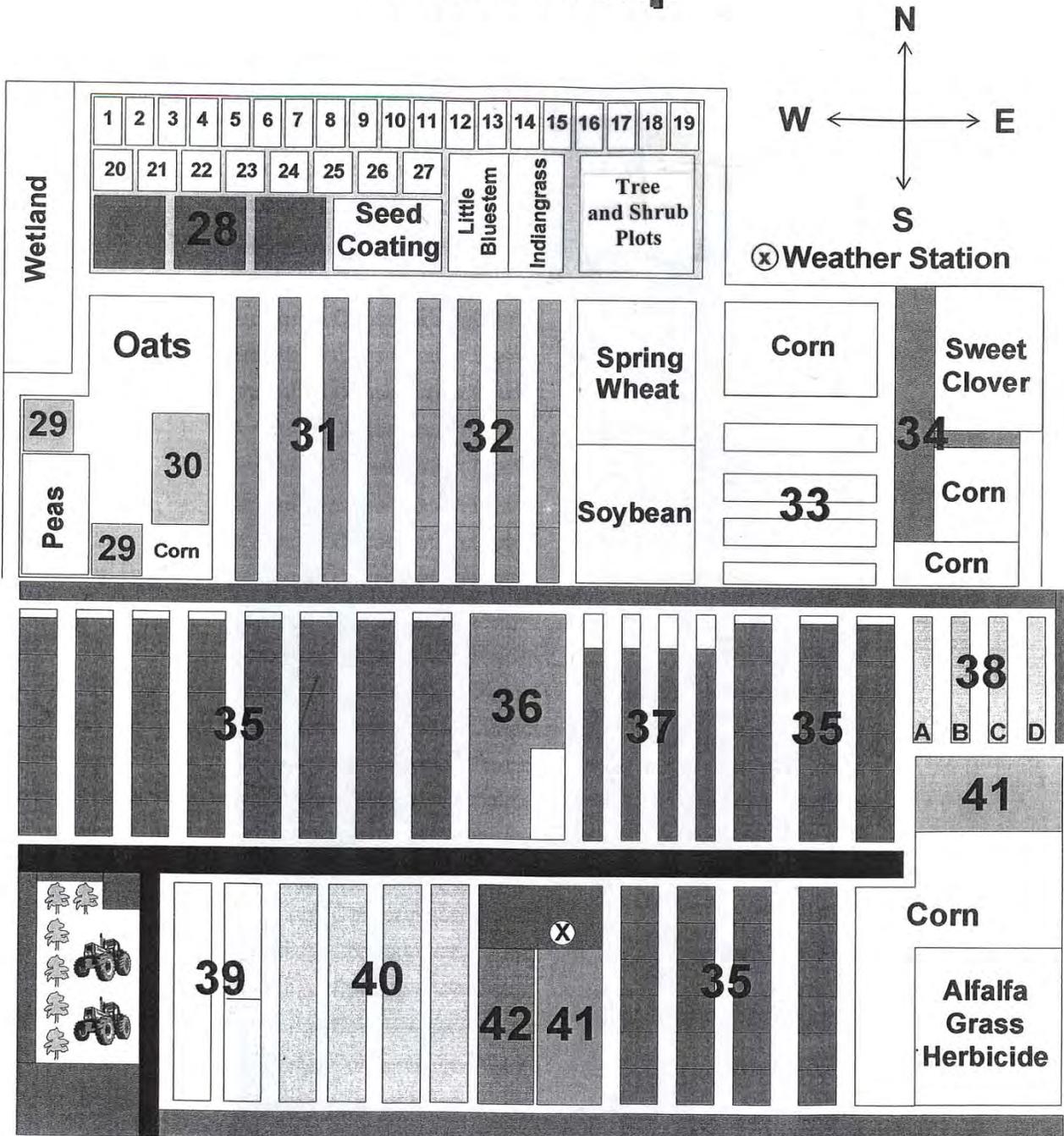


Figure BR-2. USDA-NRCS, BISMARCK PLANT MATERIALS CENTER TREE AND SHRUB EVALUATION PLOTS, EASTERN SOUTH DAKOTA SOIL AND WATER RESEARCH FARM, BROOKINGS, SD

Short to Medium Shrubs (south side)

Row 1

1. **(east end)** Mugo pine (9082889), introduced evergreen with conservation potential from Big Sioux Nursery.
2. Common ninebark (9082891), native species from Iowa grown by Big Sioux Nursery.
3. Wayfaring bush (9082642), introduced species grown by Lincoln-Oakes Nurseries from long-lived specimens growing at the Oakes Nursery.
4. Seaberry (9082887), introduced suckering shrub silver in color with orange fruit high in vitamin C content.
5. American hazelnut (9082888), native species from North Dakota grown by Lincoln-Oakes Nurseries.
6. American currant (9082687), native species from South Dakota grown by Big Sioux Nursery.
7. Missouri gooseberry (9082746), native species from South Dakota grown by Big Sioux Nursery.
8. Gray dogwood (9082890), native species from Minnesota grown by Big Sioux Nursery.
9. Gray dogwood (9082738), native species from Wisconsin grown by Lincoln-Oakes Nurseries.
10. Roundleaf hawthorn (9076686), native species from South Dakota selected by the Bismarck Plant Materials Center.
11. **(west end)** Pin cherry (9091967), native seed source from the northern Minnesota from Big Sioux Nursery.

Row 2

1. **(east end)** Arrowwood viburnum (9091976), Iowa seed source from Lincoln-Oakes Nursery.
2. Winterberry (9082711), original source from NDSU.
3. Shadblow serviceberry (9091975), commercial source from Lincoln-Oakes Nursery.
4. Chokeberry (9091971), from Bailey Nursery.
5. Chokecherry (9008183), Sheridan County, North Dakota, selected by Bismarck PMC for western-X resistance and high quality fruit yield.
6. Russian peashrub (9091969), suckering species from Big Sioux Nursery.
7. Common juniper (9019593) originates from Wilton Mine, Wilton, ND. Grown by PMC.
8. 'Silverscape' olive hybrid (9092054), Russian olive/silverberry hybrid. Grown by Lincoln-Oakes Nurseries.
9. Staghorn sumac (9092053), seed source from New York grown by Lincoln-Oakes Nurseries.
10. Ironwood (9082739) seed source from Sertoma Park, Bismarck, ND.
11. **(west end)** Skunkbush sumac (9091964) native species from Cave Hills, SD, grown by PMC.

Row 3

1. **(east end)** Cathedral Siberian/Japanese elm X (9092142), S&B Nursery, Bismarck/Bailey's Nursery, St. Paul, MN.
2. horizontal juniper (9012606), origin: Michigan PMC.
3. American highbush cranberry (9094281), from Big Sioux Nursery, Watertown, SD.
4. 'McKenzie' black chokeberry, 2008 release from PMC. (10 entries, measure east 5)
5. 'Prairie Red' plum, 2006 release from PMC (10 entries, measure east 5)
6. Nannyberry (9092141), from Schumachers Nursery, Heron Lake, MN.
7. Elderberry (9094333), from Big Sioux Nursery, Watertown, SD.
8. Korean mountain ash (9092140), commercial source from Big Sioux Nursery, Watertown, SD.

Medium to Tall Trees (north side)

Row 4 (fabric - no trees)

Row 5

1. Freeman maple (9094336), naturally occurring hybrid of silver and red maple from Big Sioux Nursery, Watertown, SD.
2. Littleleaf linden (9094335), from Big Sioux Nursery, Watertown, SD.
3. American linden (9094334), from Big Sioux Nursery, Watertown, SD.
4. White poplar (9082892), from Big Sioux Nursery, Watertown, SD.

Row 9

1. **(east end)** Juniper (Bridger-Select), from Bridger PMC, Montana. (spaded 2007)
2. Ponderosa pine (Hunter), from Bridger PMC, Montana. (spaded 2007)

SWCD site

Row 4

1. **(west end)** hackberry (9094282), South Dakota source, Pierre area.
2. 'Oahe' hackberry, release from PMC.
3. Prairie Harvest hackberry, to be released by PMC 2009, origin Polk County, MN.

Table No. BR-1: 2010 Weather Summary - Official Station - Brookings, South Dakota					
Month	Mean Temperature		Precipitation (inches)		
	(degrees Fahrenheit)		Actual		Deviation from Normal
	2010	Normal*	2010	Normal*	2010
January	8.4	10.9	0.91	0.34	0.57
February	11.6	17.9	0.67	0.40	0.27
March	34.4	30.1	1.06	1.29	-0.23
April	51.1	44.2	1.54	2.03	-0.49
May	55.7	56.7	2.68	2.95	-0.27
June	66.1	66.1	9.48	4.23	5.25
July	71.5	70.7	6.75	3.11	3.64
August	73.1	68.6	5.28	2.94	2.34
September	58.1	59.1	8.43	2.48	5.95
October	49.7	46.3	1.12	1.78	-0.66
November	32.3	30.0	0.26	1.00	-0.74
December	12.8	16.3	1.62	0.26	1.36
Annual	43.7	43.1	39.80	22.81	16.99
* National Climate Data Center 1971-2000 Monthly Normals					
		2010			
	Last Frost (28 degrees)	9-May			
	First Frost (28 degrees)	28-Oct			
	Frost Free Period	171 days			

Key to Table BR-2. 38I347K Field Evaluation of Woody Plant Materials – Brookings, South Dakota

PLOT LOCATION = plot location of the plant material within the evaluation

ACCESSION NUMBER = any accession number, PI number or cultivar name assigned to the plant material

PLANT SYMBOL = plant symbol of the genus and species (asterisk indicates the symbol is not official)

GENUS/SPECIES = common name and scientific name of the plant material

ORIGIN/SOURCE = origin and/or source of the plant material

TRANS DATE = month and day the plant material was transplanted at the evaluation site

YR PLT = year the plant materials were transplanted at the evaluation site

YR REC = year of record

MATL PLTD = type of material planted, PLBR = bareroot, CONT = containerized

NO PLTS = number of plants planted in the plot

NO SRV = number of plants surviving

PCT SRV = percent of plants surviving

VI = plant vigor (1=excellent, 3=good, 5=fair, 7=poor, 9=very poor)

CAN COV (ft) = canopy cover measured in feet

PLT HT (ft) = plant height measured in feet

Table BR-2.

Study No.: NDPMC-T-0201-CP, Field Evaluation of Woody Plant Materials, Brookings, SD

Year of Record: 2010

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN		PLT	REMARKS
											COV	HT		
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	
S1-1	9082889	PIMU80	mugo pine <i>Pinus mugo</i> Big Sioux Nursery, Watertown, SD	18-May	04	PLBR	05	5	4	80	5	0.9	1.1	
							06	5	100	4	1.0	0.7	replant 3	
							08	5	100	3	1.4	0.8	1 open form	
							10	5	100	3	2.5	2.1		
S1-2	9082891	PHOP	common ninebank <i>Physocarpus opulifolius</i> Big Sioux Nursery, Watertown, SD	18-May	04	PLBR	05	5	6	100	2	1.4	1.9	
							06	6	100	2	3.7	3.5		
							08	6	100	3	5.0	5.0	1 blight on leaves, 4 good seed	
							10	6	100	3	7.5	5.9	light mildew, spot	
S1-3	9082642	VILA	wayfaring bush <i>Viburnum lantana</i> Lincoln-Oakes Nursery, Bismarck, ND	18-May	04	PLBR	05	5	5	100	3	0.7	1.2	
							06	5	100	3	1.3	1.7	leaf burn on all	
							08	5	100	3	2.0	2.6		
							10	5	100	4	3.4	4.3	highly variable	
S1-4	9082887	HIRH80	seaberry <i>Hippophae rhamnoides</i> Lincoln-Oakes Nursery, Bismarck, ND	18-May	04	PLBR	05	5	5	100	3	0.9	2.2	
							06	5	100	3	1.9	2.9		
							08	5	100	3	3.3	4.1		
							10	5	100	3	6.4	6.2	1-2 female, 3-5 male	
S1-5	9082888	COAM3	American hazelnut <i>Corylus americana</i> Lincoln-Oakes Nursery, Bismarck, ND	18-May	04	PLBR	05	5	5	100	7	0.3	0.6	1 browsed off
							06	5	100	5	0.6	0.7	leaf burn on all	
							08	5	100	3	1.0	1.4		
							10	5	100	4	2.0	2.5	highly variable	
S1-6	Riverview Germplasm 9082687	RIAM	American black currant <i>Ribes americanum</i> Bix Sioux Nursery, Watertown, SD	18-May	04	PLBR	05	5	5	100	2	1.2	1.8	
							06	5	100	3	4.0	2.6	mildew spot on all	
							08	5	100	3	5.0	3.2	1,2 blight, leaf drop	
							10	5	100	3	6.2	3.8		
								5	100	3	5.4	4.6		

Study No.: NDPMC-T-0201-CP, Field Evaluation of Woody Plant Materials, Brookings, SD

Year of Record: 2010

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN		PLT HT	REMARKS
											COV	VI		
S1-7	9082746	RIMI	Missouri gooseberry <i>Ribes missouriense</i> Big Sioux Nursery, Watertown, SD	18-May	04	04	PLBR	5	5	100	3	1.8	1.7	
											3	3.1	2.5	red fall color on all
											3	3.8	3.3	3-5 some leaf drop, blight
											4	4.5	3.7	early leaf drop
											5	4.1	3.6	
S1-8	9082890	CORA6	gray dogwood <i>Cornus racemosa</i> Big Sioux Nursery, Watertown, SD	18-May	04	04	PLBR	5	5	100	4	0.8	1.3	3 browsed
											3	1.4	1.9	leaf spot on 5
											3	2.2	2.6	1,2,5 leaf spot
											4	3.8	3.9	highly variable; 4 very leafy
											3	4.2	4.6	
S1-9	9082738	CORA6	gray dogwood <i>Cornus racemosa</i> Lincoln-Oakes Nursery, Bismarck, ND	18-May	04	04	PLBR	5	5	100	2	1.1	2.4	
											3	1.9	2.8	leaf spot on 1 and 5
											2	3.4	3.8	1 bad leaf spot
											2	5.0	5.3	
											3	5.2	6.0	leaf spot on all
S1-10	9076686	CRCH	roundleaf hawthorn <i>Crataegus chrysocarpa</i> Lincoln-Oakes Nursery, Bismarck, ND	18-May	04	04	PLBR	5	5	100	4	0.4	0.5	heavily browsed
											4	0.7	1.3	browsed
											5	1.0	2.0	1 white aphid
											4	2.3	3.9	
											4	2.8	5.6	
S1-11	9091967	PRPE2	pin cherry <i>Prunus pensylvanica</i> Big Sioux Nursery, Watertown, SD	10-May	05	05		5	5	100	3	2.9	2.9	5 close spacing
											3	4.2	4.1	4,5 leaf spot
											3	4.3	5.0	
											5	7.8	7.1	deer rub 1,4; 5 close spacing
S2-1	9091976	VIDE	arrowwood viburnum <i>Viburnum dentatum</i> Lincoln-Oakes Nursery, Bismarck, ND	10-May	05	05		5	5	100	3	0.9	2.2	1 and 4 has fruit
											3	2.2	2.6	clean leaves, no disease
											3	3.1	3.3	no fruit
											3	4.9	5.0	1 clean leaves, some fruit

Study No.: NDPMC-T-0201-CP, Field Evaluation of Woody Plant Materials, Brookings, SD

Year of Record: 2010

PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		<u>REMARKS</u>				
											COV <u>VI</u>	HT <u>(ft)</u>					
S2-2	9082711	EUBU6	winterberry	10-May	05	05		5	5	100	4	0.7	1.2				
			<i>Euonymus bungeanus</i>								06	5	100		4	1.1	1.5
			Lincoln-Oakes Nursery, Bismarck, ND								07	5	100		4	2.1	2.7
											09	5	100		4	4.7	3.9
S2-3	9091975	AMLA9	serviceberry	10-May	05	05		5	5	100	4	0.9	1.9	leaves chewed on			
			<i>Amelanchier lamarckii</i>								06	5	100		3	3.0	2.9
			Lincoln-Oakes Nursery, Bismarck, ND								07	5	100		2	3.9	3.8
											09	5	100		2	6.6	7.1
S2-4	9091971	PHME13	black chokeberry	10-May	05	05		5	5	100	3	1.5	2.1	fruit on all			
			<i>Photinia melanocarpa</i>								06	5	100		3	2.2	2.7
			Bailey Nurseries, Inc.								07	5	100		2	2.7	3.3
											09	5	100		3	4.7	4.6
S2-5	9008183	PRVI	common chokecherry	10-May	05	05		5	5	100	3	0.7	2.5				
			<i>Prunus virginiana</i>								06	5	100		3	2.0	4.0
			Lincoln-Oakes Nursery, Bismarck, ND								07	5	100		3	2.6	5.4
											09	5	100		4	5.1	8.4
S2-6	9091969	CAFR80	Russian peashrub	10-May	05	05		5	5	100	4	0.5	2.2				
			<i>Caragana frutex</i>								06	5	100		6	0.4	1.3
			Big Sioux Nursery, Watertown, SD								07	5	100		6	0.5	1.5
											09	5	100		4	1.2	2.4
S2-7	9019593	JUCO6	common juniper	2-May	06	CONT		5	5	100	3	2.6	0.8				
			<i>Juniperus communis</i>								07	5	100		2	3.9	0.8
			Wilton Mine, ND/McKenzie FEP, ND								08	5	100		2	5.8	1.5
											10	5	100		3	8.0	2.3
S2-8	9092054 'Silverscape'	ELAEA	Russian olive/silverberry hybrid	2-May	06	POTD		5	2	40	2	3.1	4.3	2,3,5 recently dead, canker?			
			<i>Elaeagnus X 'Jefmorg'</i>								07	4	80		6	1.4	2.6
			Lincoln-Oakes Nursery, Bismarck, ND								08	4	80		5	3.9	4.6
											10	4	80		4	6.2	6.8

Study No.: NDPMC-T-0201-CP, Field Evaluation of Woody Plant Materials, Brookings, SD

Year of Record: 2010

PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		<u>REMARKS</u>						
											COV <u>VI</u>	PLT <u>(ft)</u>							
S2-9	9092053	RHTY	staghorn sumac	2-May 06	06	PLBR		5	5	100	3	3.8	5.0	clean leaves, no disease					
			<i>Rhus typhina</i>								07		5		4.8	6.2			
			Lincoln-Oakes Nursery, Bismarck, ND								08		5		100	3	8.9	8.9	
											10		5		100	5	8.2	8.8	
S2-10	9082739	OSVI	ironwood	May 07	07			5	5	100	0.7	1.4	rabbit damage 1,5						
			<i>Ostrya virginiana</i>								08			5	100	4	0.7	1.9	
			Sertoma Park, Bismarck, ND								09			5	100	4	1.7	2.3	
			USDA, NRCS, PMC, Bismarck, ND																
S2-11	9091964	RHTR	skunkbush sumac	May 07	07			5	5	100	3	0.8	1.3						
			<i>Rhus trilobata</i>								08		3		60	3	1.9	1.6	2,5 leafed and died; 4 weeping
			Cave Hills, SD								09		4		80	3	1.9	1.4	
			USDA, NRCS, PMC, Bismarck, ND																
S3-1	'Cathedral' 9092142	ULMUS	Siberian/Japanese elm cross	May 07	07			5	5	100	4	1.6	8.6	no leaves on 1					
			<i>Ulmus X 'Cathedral'</i>								08		2	40		6.1	5.1	animal damage on all	
			S& B Nursery, Bismarck, ND (Bailey's)								09		2	40		10.5	8.3	2,3 herb damage, multi-stems	
S3-2	9012606	JUHO2	creeping juniper		08			5	5	100	3	2.1	0.4						
			<i>Juniperus horizontalis</i>								09		5		100	3	4.0	0.5	
			Golden Valley County, ND								10		5		100	2	4.5	0.5	
S3-3	9094281	VIOPA2	American highbush cranberry	7-May 09	09			5	5	100	3	1.6	2.0						
			<i>Viburnum opulus var. americanum</i>								10		5		100	4	2.5	3.2	
S3-4	'McKenzie' 323597	PHME13	black chokeberry		08			5	5	100	2	2.8	2.5	all large fruit					
			<i>Photinia melanocarpa</i>								09		5		100	2	4.2	3.7	
			USDA, NRCS, PMC, Bismarck, ND								10		5		100	2	4.8	4.2	
S3-5	'Prairie Red' 9047203	PRUNU	hybrid plum		08			5	5	100	3	3.6	5.1	highly variable					
			<i>Prunus sp.</i>								09		5		100	3	4.3	6.3	
											10		5		100	4	4.6	6.9	

Study No.: NDPMC-T-0201-CP, Field Evaluation of Woody Plant Materials, Brookings, SD

Year of Record: 2010

PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT	<u>REMARKS</u>				
				DATE	PLT	REC	PLTD	PLTS	SRV	SRV	VI	(ft)		(ft)			
S3-6	9092141	VILE	nannyberry	May	07	07		5	5	100	2	0.5	1.4				
			<i>Viburnum lentago</i>														
			Schumacher's, Heron Lake, MN														
S3-7	9094333	SANIC4	common elderberry <i>Sambucus nigra</i> ssp <i>canadensis</i> Big Sioux Nursery, Watertown, SD			10		5	5	100	3	0.7	1.1				
S3-8	9092140	SOAL9	Korean mountain ash	May	07	07		5	5	100	6	0.4	1.2	rabbits 1,5; no leaves 1,4			
			<i>Sorbus alnifolia</i>														
			Big Sioux Nursery, Watertown, SD														
T1-1	9082853	PRMA9	amur chokecherry	18-May	04	04	PLBR	5	5	100	3	1.4	2.6				
			<i>Prunus maackii</i>														
			Lincoln-Oakes Nursery, Bismarck, ND														
			spaded														
T1-2	9076737	PRSE2	black cherry	18-May	04	04	PLBR	5	5	100	3	1.4	2.3				
			<i>Prunus serotina</i>														
			Lincoln-Oakes Nursery, Bismarck, ND														
			spaded														
5-1	9094336	ACFR	Freeman maple <i>Acer x freemanii</i> Big Sioux Nursery, Watertown, SD	6-May	10	10	PLBR	5	5	100	3	0.5	1.5				
5-3	9094334	TIAM	American linden <i>Tilia americana</i> Big Sioux Nursery, Watertown, SD	6-May	10	10	PLBR	5	5	100	3	1.1	1.8				
5-2	9094335	TICO2	littleleaf linden <i>Tilia cordata</i> Big Sioux Nursery, Watertown, SD	6-May	10	10	PLBR	5	5	100	5	0.5	1.0	tip dieback on 1			

Study No.: NDPMC-T-0201-CP, Field Evaluation of Woody Plant Materials, Brookings, SD

Year of Record: 2010

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
5-4	9082892	POAL7	white poplar <i>Populus alba</i> Big Sioux Nursery, Watertown, SD	6-May	10	10	PLBR	5	5	100	3	1.9	3.4	
T2-1	Bridger Select 9078631	JUSC2	Rocky Mountain juniper <i>Juniperus scopulorum</i> USDA, NRCS, Bridger, MT	10-May	05			5	5	100	2	0.8	1.5	good color
					06				5	100	2	1.5	2.8	
					07				4	80	2	1.9	3.2	
					09				4	80	4	3.1	4.5	
T2-2	Hunter Germplasm 9081843	PIPO	ponderosa pine <i>Pinus ponderosa</i> USDA, NRCS, Bridger, MT	10-May	05			5	5	100	3	0.6	1.2	
					06				5	100	2	1.3	1.8	
					07				5	100	2	1.6	2.1	
					09				5	100	3	3.1	4.2	
Row 4	9094282	CEOC	hackberry <i>Celtis occidentalis</i> South Dakota source Big Sioux Nursery, Watertown, SD	8-May	09			4	4	100	4		3.8	in Tubex
					10				4	100	3		5.6	in Tubex
Row 4	'Oahe'	CEOC	hackberry <i>Celtis occidentalis</i> Big Sioux Nursery, Watertown, SD	8-May	09			5	5	100	3		3.0	in Tubex
					10				5	100	3		5.4	
Row 4	Prairie Harvest Germplasm 9034956 ND-3878	CEOC	hackberry <i>Celtis occidentalis</i> Polk County, MN	8-May	09			5	5	100	3		3.5	in Tubex
					10				4	80	3		4.8	



2010 Report Off-Center Evaluation Planting of Woody Plant Materials Brookings, South Dakota

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USDA-Natural Resources Conservation Service, Bismarck, North Dakota*

INTRODUCTION

The Plant Materials Center (PMC), located at Bismarck, North Dakota, was established in 1954 as part of the U.S. Department of Agriculture's Soil Conservation Service, now the Natural Resources Conservation Service (NRCS). The Bismarck PMC serves the States of Minnesota, North Dakota, and South Dakota. Tree and shrub improvement has always been an integral part of the plant materials program in South Dakota. There is a need to evaluate how different trees and shrubs will perform in diverse soil and climatic conditions. The PMC currently has tree and shrub evaluation sites at five locations in the three-state area, including this site in South Dakota.

This evaluation planting is in cooperation with the Eastern South Dakota Soil and Water Research Farm which consists of 15 Conservation Districts (CD) in eastern South Dakota. The purpose of the Research Farm is to promote research of efficient farm production practices that conserve soil and water resources. The Major Land Resource Area is 102A, Rolling Till Prairie. The soils on this farm are characteristic of those found in northeastern South Dakota and west central Minnesota and are similar to soils common to the northern Corn Belt region. Long-term average precipitation is 22.81 inches. The Research Farm consists of 80 acres approximately 1 mile north of the campus of South Dakota State University. The first trees and shrubs were planted at the new site beginning in 2004. The existing ground cover is smooth brome grass sod. Strips to be planted are chemically killed with glyphosate, and then tree fabric is laid down. Holes are opened in the fabric when new entries are planted. The trees are spaced 10 feet apart within the row, and the shrubs are spaced 5 feet apart within the row. The evaluation site is divided into an area on the south for shrubs, and an area on the north for medium to tall trees. Measurements and notes are taken at the end of each growing season. Annual rainfall in 2010 was over 38 inches which was close to the double the long-term normal. High rainfall months were June, July, August, and September. Each month was two to three times the long-term normal. According to climate records, this is the highest annual rainfall ever recorded for Brookings going back to 1893.

OBJECTIVES

6. Conduct evaluation studies to determine the potential adaptation and performance of new and/or previously untested woody plant materials for conservation purposes.
7. Conduct advanced evaluation and progeny testing of selected strains of woody plant materials.
8. Establish seed and plant increase of selected accessions.
9. Develop and release improved plant materials for public use.
- Promote evaluation site for tours and other educational purposes.



Two new strips of weed barrier were installed in the tall tree block in 2010.

ACTIVITIES IN 2010

Approximately 39 accessions of 29 different species are currently being evaluated. The construction of a new building in 2006 for the Brookings County CD resulted in the loss of the original tree block. Entries which were removed included two accessions of aspen, white poplar, Kentucky coffeetree, and two accessions of red oak. Some of the trees were moved with a tree spade into another area which will be used as the start of the new tree block. The grass strips between the tree rows were kept mowed during the growing season. Weeds growing in the fabric hole with the trees and shrubs were removed by NRCS field office staff.

Five new entries were added on May 4, 2010. They included common elderberry (*Sambucus nigra* ssp. *canadensis*), littleleaf linden (*Tilia cordata*), American linden (*Tilia americana*), Freeman maple (*Acer x freemanii*) and white poplar (*Populus alba*). All plants were bareroot seedlings received from Big Sioux Nursery, Watertown, South Dakota. An inventory was taken and the planting plan was updated. The trees that were moved with the tree spade had been

removed. These included the Amur chokecherry, black cherry, and aspen. Missing stakes were replaced.

NRCS field office and state office staff helped collect data on selected entries on August 19, 2010. Measurements and notes were taken on crown spread and plant height, disease and insect damage, drought and cold tolerance, fruit production, survival, vigor, and animal damage. Information was collected on 26 accession/entries in 2010. Fruit crops were good to excellent for most of the shrub species. Some of the shrub species that were rated in high vigor and performing well included arrowwood, common ninebark, seaberry, hazelnut, black currant, hawthorn, pin cherry, winterberry, skunkbush sumac, and common juniper. One entry of skunkbush sumac was prostrate and growing almost flat on the ground. Gooseberry was diseased and dying.

Data is summarized annually and documented in the Bismarck PMC Annual Technical Report. Anyone who desires a copy of the latest data summary information can contact Dwight Tober at (701) 530-2075 or Dwight.Tober@nd.usda.gov, or the Brookings NRCS field office (605) 692-8003. The report is about eight pages in length.



Entries were measured on August 19, 2010.

NEW RELEASES

Riverview germplasm American black currant was released in 2010. It is a source identified release from northeast South Dakota. Big Sioux Nursery at Watertown, South Dakota collected the seed and grew the original plants.

ACKNOWLEDGMENTS

This research is sponsored and supported by the Eastern South Dakota Soil and Water Research Farm, the NRCS and Brookings County CD at Brookings, the NRCS field support office at Brookings, and the NRCS State office at Huron. Appreciation goes to the NRCS and CD field offices' staffs, and the Research Farm staff for the special attention given to the care and maintenance of the test plots.



Three sources of hackberry (tubes) are being compared at the CD demonstration site.

Helping People Help the Land

All programs and services are offered on a nondiscriminatory basis.

OFF-CENTER EVALUATION PLANTING: TECHNICAL REPORT 2010

Study NDPMC-P-1001-WI Lodgepole Pine Evaluation

Study Title: Field Evaluation of Woody Plant Materials

Objective: Evaluate various selected seed sources of lodgepole pine in both replicated and non-replicated field trials in western North and South Dakota. Data collection will document both species performance in windbreaks and seed source differences.

Introduction: Lodgepole pine (*Pinus contortus* var. *latifolia*) is a native conifer species known for its long, slender trunk and high, thin crown. It grows on a wide variety of soils but does best on medium-textured soils derived from coarse parent materials. Lodgepole pine may have potential as an additional tall tree species for conservation use in the western parts of North and South Dakota.

Cooperators: The USDA Natural Resources Conservation Services, Plant Materials Center (PMC), Bismarck, North Dakota, in cooperation with various cooperators including NRCS field offices located at Dickinson and Hettinger, ND, and Hot Springs, SD; Lake Angostura State Park, SD; NDSU Hettinger Research Extension Center (HREC), ND; and the Flying O Ranch near Hebron, ND.

Location: Flying O Ranch, Hebron, ND (non-replicated); Hettinger Research and Extension Center, Hettinger, ND (replicated); and, Angostura State Park, Hot Springs, SD (replicated).

Major Land Resource Area (MLRA): The sites are located in MLRA 54, the Rolling Soft Shale Plain; and MLRA 61, the Black Hills Foot Slopes.

Soils: The Hebron site is a fine sandy loam. The Hettinger site is an Arnegard silt loam, and the Hot Springs planting is on a Savo silt loam.

Climate: The average annual precipitation for MLRA 54 is 12 to 17 inches with an average freeze-free period of 110 to 135 days. The average annual precipitation for MLRA 61 is 15 to 18 inches with an average freeze-free period of 110 to 140 days.

Methods and Materials

Assembly: Cones were collected from superior trees (Table LP-1) in a provenance study at the Agricultural Research Service, Northern Great Plains Research Lab at Mandan, North Dakota. Cones were processed at the Bismarck PMC and the seed was separated. Towner State Nursery (TSN) grew out seedlings of each source and provided them for the study.

Table LP-1. Selected Seed Sources

Accession	Origin	Seedlings
14107(107)	British Columbia (Jacobie Creek)	500+
14108(108)	British Columbia (Lac le Jeune)	45
14109(109)	British Columbia (Clearwater)	400
14070 (070)	Colorado (Routt National Forest - Salida)	100
13351-10 (1-10)	Montana (Beaverhead National Forest – Dillon)	125
14105 (105)	Saskatchewan (Cypress Hills Provincial Park)	75
MP-718	Mongolian Scotch Pine	PMC
MP-158	Mongolian Scotch Pine	PMC
PP	Ponderosa Pine	TSN

Planting Plan:

Replicated (2 sites) – One site each in western North Dakota (Hettinger REC) and South Dakota (Angostura State Park). Total number of trees at each site equals 3 plant plots x 5 randomized replications x 8 seed sources = 120 trees at each site, 15 of each accession. Accession MP-718 was used in the replicated trials. Ponderosa pine was included as a standard of comparison.

Non-replicated (1 site) – The one non-replicated site in western North Dakota near Hebron had 5 plant plots for each entry. Accession 108 was not included. Ten entries of accession 109 were included. Ponderosa pine was used as a standard of comparison. A total of 40 trees were planted.

Plot Preparation: All three sites were cultivated. The Hebron site is near an existing windbreak by a farmstead. The trees were planted into weed barrier fabric. The Hettinger site is cropland on the outside of a deteriorating windbreak. Large cages were placed around the trees to protect from deer. The Angostura site is part of a recreation area. Trees were planted into 2' x2' fabric squares.

Planting Dates: All plots were planted in the spring of 2008. The Hebron site was planted on May 16; the Hettinger site on May 12; and the Angostura site on May 14.

Irrigation: The trees are not irrigated.

Evaluations and Measurements:

2008: Survival, vigor ratings, and height measurements were taken the end of the growing season in 2008. Initial survival was greater than 80% at all sites. Vigor ratings were in the average range (3-5), and height averaged approximately .75 to 1 foot. Trees at Angostura State Park were browsed repeatedly by deer and killed during the fall and winter. Approximately 75% of the lodgepole pines were damaged and 50% of the ponderosa pines.

2009: Replacements at Angostura State Park were planted on May 15, 2009, in the first three replications. Most of the trees replanted in replications four and five were ponderosa pine. Cages were installed on the first three replications (south two rows). Animal repellent was sprayed on all the trees after replanting.

2010: Dead and missing plants in the spring were replanted at all sites to either Mongolian pine or ponderosa pine. Many of the plants at Hettinger had a major flush of annual weed growth in the hole of the fabric and on the edge. The heaviest infestations were removed, and granular Surflan was applied and incorporated by hand. Replacements at Hot Springs were planted in early June. Rainfall conditions were again good to excellent at the three sites. Dense growth of Russian thistle again provided protection from deer at Hebron. Overall, the plants were not vigorous at Hot Springs, and the 3' x3' fabric squares may not provide adequate weed control in the sod. See Table LP-2 for 2009-2010 data collected at the Hebron site; Table LP-3 for 2009-2010 data collected at the Hettinger site; and Table LP-4 for 2010 data collected at Angostura State Park near Hot Springs, SD.

**Table LP-2. Non-replicated Conservation Field Trial planted in 2008 near Hebron, North Dakota.
Data was collected on September 23, 2009, and September 26, 2010.**

Accession No.	Plant No.	Survival	Vigor (1= highest, 9= poorest)		Height (ft)		Remarks (2009)
			2009	2010	2009	2010	
70	1	x	3	2	1.00	1.75	
	2	x	3	2	1.50	1.75	
	3	x	3	3	1.00	1.25	
	4	x	3	4	1.50	1.25	
	5	x	3	5	1.00	1.25	
105	1	x	4	2	0.75	1.25	
	2	x	4	2	0.75	1.50	
	3	x	3	2	0.75	1.00	
	4	x	3	2	1.00	1.25	
	5	x	5	5	0.50	0.50	browsed
PP	1	x	3	2	1.75	2.50	
	2	x	3	9	1.00	0.00	
	3	x	3	3	1.00	1.50	
	4	x	4	9	1.00	0.00	
	5	x	3	2	1.25	1.25	
107	1	x	4	2	1.75	2.00	browsed
	2	x	3	9	1.75	1.25	
	3	x	3	3	1.25	1.25	
	4	x	5	3	1.00	1.00	
	5	x	4	1	1.50	2.00	
MP-158	1	x	3	3	1.25	1.50	
	2	x	3	2	1.25	2.00	
	3	x	2	1	1.75	3.25	
	4	x	2	1	1.75	2.25	
	5	x	2	2	1.75	1.75	
109	1	x	3	9	1.50	0.00	
	2	x	2	2	1.50	2.00	
	3	x	4	3	0.75	1.25	
	4	dead	NA	NA	NA	NA	
	5	dead	NA	NA	NA	NA	
	6	x	3	2	1.00	2.00	
	7	x	3	9	0.75	0.00	
	8	x	3	3	1.50	1.25	
	9	x	4	1	1.00	2.25	
	10	x	4	1	1.00	2.00	
1(10)	1	x	4	4	1.75	1.00	
	2	x	4	9	1.75	0.00	
	3	x	2	2	1.75	2.25	browsed
	4	x	3	4	1.50	1.25	
	5	x	4	4	0.75	0.75	

Table LP-3. Replicated Conservation Field Trial planted in 2008 near Hettinger, North Dakota. Data was collected on September 23, 2009, and September 27, 2010. (Repl) in 2010 are replants of different sources.

Accession No.	Plant No.	Survival	Vigor (1= highest, 9= poorest)		Height (ft)		Remarks (2009)
			2009	2010	2009	2010	
Rep 1							
70	1	x	3	3	1.25	2.00	
	2	x	4	3	1.25	1.75	
	3	x	NA	2	1.25	1.75	30% brown needles
105	1	x	3	1	1.25	2.25	
	2	x	3	1	1.50	2.00	good growth
	3	x	3	1	1.25	2.25	good growth
108	1	x	2	2	1.25	2.00	
	2	x	2	1	1.40	2.50	good growth
	3	x	4	3	1.00	1.25	stressed
PP	1	x	5	4	1.00	1.25	
	2	x	2	1	2.00	2.75	
	3	x	3	1	1.50	2.50	
107	1	x	2	1	1.75	2.75	good growth
	2	x	3	1	1.25	2.25	
	3	x	3	1	1.25	2.25	
MP-718	1	x	3	3	1.50	2.50	
	2	x	3	3	1.50	2.50	
	3	x	3	2	1.40	2.75	
109	1	x	3	3	1.50	2.00	
	2	x	3	2	1.50	2.50	
	3	x	4	2	1.50	2.00	exposed roots
1 (10)	1	x	4	2	1.25	2.00	
	2	x	2	1	1.75	3.00	
	3	x	4	3	1.25	2.00	
Rep 2							
70	1	x	3	1	1.50	2.50	
	2	x	2	1	1.75	2.75	
	3	x	3	3	1.50	2.25	
105	1	x	2	3	2.00	3.00	
	2	x	3	1	1.50	2.50	
	3	x	3	3	1.25	1.75	yellowish
108	1	x	4	4	1.25	1.75	bud gone
	2	x	4	3	1.50	2.00	
	3	x	4	3	1.25	3.00	
PP	1	x	4	2	1.50	2.50	
	2	x	4	2	1.50	2.25	
	3	x	3	2	1.50	2.25	

Accession No.	Plant No.	Survival	Vigor (1= highest, 9= poorest)		Height (ft)		Remarks (2009)
			2009	2010	2009	2010	
107	1	x	3	1	2.00	3.00	
	2	x	3	2	1.50	2.25	
	3	x	2	2	1.25	2.00	
MP-718	1	x	3	3	1.25	3.00	
	2	x	3	3	1.50	2.25	
	3	x	4	4	1.25	1.25	
109	1	x	3	3	1.50	2.75	
	2	x	2	1	1.75	2.75	
	3	x	4	2	1.25	2.00	
1 (10)	1	x	3	3	2.00	2.25	
	2	x	4	2	1.50	2.25	
	3	x	3	2	1.50	2.25	
Rep 3							
70	1	x	4	2	1.25	1.75	dense Russian thistle
	2	x	3	1	1.50	2.25	dense Russian thistle
	3	x	4	2	1.25	2.25	dense Russian thistle
105	1	x	4	1	1.25	1.75	dense Russian thistle
	2	x	4	2	1.25	1.75	dense Russian thistle
	3	x	4	2	1.00	1.75	dense Russian thistle
108	1	x	4	2	1.00	2.50	dense Russian thistle
	2	x	3	1	1.75	2.25	dense Russian thistle
	3	x	4	4	1.25	1.75	dense Russian thistle
PP	1	x	4	3	1.25	1.75	dense Russian thistle
	2	x	4	2	1.50	2.25	dense Russian thistle
	3	x	5	3	1.00	1.25	dense Russian thistle
107	1	x	3	2	1.75	3.00	dense Russian thistle
	2	x	2	1	2.25	3.25	dense Russian thistle
	3	x	3	2	1.50	2.25	dense Russian thistle
MP-718	1	x	2	3	1.75	2.75	dense Russian thistle
	2	x	2	3	1.75	2.50	dense Russian thistle
	3	x	3	4	1.50	2.00	dense Russian thistle
MP 157	1	x	(Repl)	3	(Repl)	1.50	dense Russian thistle
109	2	x	4	2	1.00	1.25	dense Russian thistle
	3	x	4	1	1.25	1.75	dense Russian thistle
MP 158	1	x	(Repl)	2	(Repl)	1.50	dense Russian thistle
PP	2	x	(Repl)	3	(Repl)	0.75	dense Russian thistle
1 (10)	3	x	(Repl)	1	(Repl)	2.50	
Rep 4							
70	1	x	6	3	1.00	1.25	
	2	x	4	2	1.00	1.75	
	3	x	4	1	1.25	2.25	

Accession No.	Plant No.	Survival	Vigor (1= highest, 9= poorest)		Height (ft)		Remarks (2009)
			2009	2010	2009	2010	
105	1	x	3	1	1.50	2.25	
	2	x	2	1	2.00	3.25	
	3	x	3	1	1.50	2.25	
108	1	x	5	3	1.00	1.00	
	2	x	5	2	1.25	1.75	
	3	x	5	1	1.25	2.25	
PP	1	x	6	2	0.75	1.75	
	2	x	6	4	1.00	1.25	
	3	x	4	2	1.00	2.00	
MP-718	1	x	3	2	1.50	2.35	
	2	x	3	3	1.75	1.25	dense Russian thistle
	3	x	3	3	1.75	2.50	dense Russian thistle
107	1	x	4	1	1.50	2.50	dense Russian thistle
	2	x	6	2	1.25	1.25	dense Russian thistle
MP 157	3	x	(Repl)	2	(Repl)	1.50	dense Russian thistle
109	1	x	4	1	1.25	1.50	dense Russian thistle
	2	x	3	1	1.50	2.00	dense Russian thistle
	3	x	4	2	1.25	1.50	dense Russian thistle
1 (10)	1	x	3	1	1.75	2.25	dense Russian thistle
	2	x	4	1	1.50	2.25	dense Russian thistle
	3	x	5	2	1.25	1.75	dense Russian thistle
Rep 5							
70	1	x	6	2	1.25	1.50	brown needles
	2	x	6	1	1.25	1.50	no bud
	3	x	6	1	1.50	1.50	dense Russian thistle
MP 156	1	x	(Repl)	2	(Repl)	1.50	dense Russian thistle
MP 157	2	x	(Repl)	1	(Repl)	1.25	brown needles
105	3	x	5	4	1.50	1.00	dense Russian thistle
MP 157	1	x	(Repl)	2	(Repl)	1.25	dense Russian thistle
MP 154	2	x	(Repl)	1	(Repl)	1.50	dense Russian thistle
MP 157	3	x	(Repl)	1	(Repl)	1.25	dense Russian thistle
PP	1	x	4	1	1.50	1.50	dense Russian thistle
	2	x	4	1	1.25	1.50	dense Russian thistle
	3	x	4	4	1.25	1.50	dense Russian thistle
107	1	x	(Repl)	2	(Repl)	1.50	dense Russian thistle
	2	x	4	2	1.25	2.25	dense Russian thistle
	3	x	3	1	1.75	2.75	dense Russian thistle
MP-718	1	x	2	2	2.00	2.75	dense Russian thistle
	2	x	2	3	2.00	2.75	dense Russian thistle
	3	x	2	3	2.00	2.75	dense Russian thistle

Accession No.	Plant No.	Survival	Vigor (1= highest, 9= poorest)		Height (ft)		Remarks (2009)
			2009	2010	2009	2010	
109	1	x	3	1	1.50	2.50	dense Russian thistle
	2	x	4	1	1.75	2.50	dense Russian thistle
	3	x	5	5	1.00	1.00	
1 (10)	1	x	4	1	1.50	2.75	
	2	x	3	1	1.25	2.25	
	3	x	2	1	1.75	2.25	

Table LP-4. Replicated Conservation Field Trial planted in 2008 at Angustora State Park near Hot Springs, South Dakota. Data was collected on 10/13/09 and 9/28/10. Most entries were replanted 5/6/09 due to deer damage. Replications 4 and 5 were replanted to ponderosa pine and are not included in this table. Protective cages were installed through most of replication 3 in 2009.

Accession No.	Plant No.	Survival	Vigor (1= highest, 9= poorest) 2010	Height (ft) 2010	Remarks 2010
Rep 1					
70	1	x	4	1.25	yellow foliage
	2	x	4	1.50	
	3	x	4	1.25	
105	1	x	8	1.00	2 green needles
	2	x	4	1.00	
	3	x	1	1.50	
108	1	x	4	1.50	
	2	x	7	0.75	
	3	dead	NA	NA	
PP	1	x	3	1.75	
	2	x	7	0.50	
	3	x	2	1.75	
107	1	x	4	1.50	
	2	x	3	2.00	
	3	dead	NA	NA	
MP 158	1	x	3	2.00	
MP 718	2	x	6	1.00	
MP 718	3	x	3	1.75	volunteer elm
109	1	x	5	1.75	
	2	x	5	1.50	
	3	x	3	2.25	
1 (10)	1	x	4	2.50	yellow foliage
	2	x	2	2.25	
	3	x	2	2.00	
Rep 2					
70	1	x	3	1.25	
	2	x	3	1.50	
	3	x	4	1.50	no cage, flood sediments
105	1	x	4	1.25	no id stake
	2	dead	NA	NA	no id stake
	3	dead	NA	NA	no id stake
108	1	x	2	1.50	flood sediments
	2	x	8	1.00	1 live limb
	3	x	3	1.25	

Accession No.	Plant No.	Survival	Vigor (1= highest, 9= poorest) 2010	Height (ft) 2010	Remarks 2010
PP	1	x	4	1.25	
	2	x	3	1.50	
	3	x	3	1.00	
107	1	dead	NA	NA	
	2	dead	NA	NA	
	3	x	1	1.75	
MP 158	1	x	3	2.25	
MP 158	2	x	4	2.00	yellow foliage
	3	x	5	1.00	yellow/brown foliage
109	1	x	3	2.25	
	2	x	3	2.00	
	3	x	8	2.25	
1 (10)	1	x	4	2.25	
	2	x	3	2.00	
	3	x	5	2.25	
Rep 3					
70	1	x	2	1.00	
	2	x	5	0.75	
	3	x	6	0.50	
105	1	x	8	1.75	few green needles
	2	x	8	1.50	few green needles
	3	x	5	1.25	yellow
108	1	x	3	1.50	
	2	x	3	1.25	
	3	dead	NA	NA	
PP	1	x	7	1.00	
	2	dead	NA	NA	
	3	x	6	1.00	
107	1	x	4	1.75	
	2	dead	NA	NA	
	3	x	5	1.25	
MP 158	1	x	4	1.00	
MP 718	2	x	4	1.50	
MP 719	3	x	3	2.00	
109	1	x	5	1.50	
	2	x	5	1.25	
	3	x	NA	NA	
1 (10)	1	x	5	1.25	
	2	x	NA	NA	
	3	x	NA	NA	

ASSEMBLY AND INITIAL EVALUATION

Major Seed Source Studies and Assemblies

MAJOR SEED SOURCE STUDIES AND ASSEMBLIES: TECHNICAL REPORT – 2010

Study NDPMC-T-0008-WL

Study Title: Native Shrubs for Conservation, Skunkbush sumac *Rhus trilobata*

Introduction: Skunkbush sumac is a native shrub which has been used to a limited extent in wildlife plantings, as well as other conservation plantings. It has potential for use in riparian plantings. In 1979 the variety 'Bighorn' was released by the New Mexico PMC. This accession originated from Basin, Wyoming, where the precipitation is 6.7 inches. There is some indication Bighorn skunkbush sumac is affected by rust when planted in areas of higher precipitation.

Objective: The PMC would like to find a selection from the Dakotas, east of the Badlands. This species has been reported to occur as far east as Emmons County, ND. There is a need for a selection which is adapted to more humid climates than the original Bighorn source. Seed sources from the most northern and most eastern ecotypes will be collected.

Cooperators: USDA, NRCS Plant Materials Center and Lincoln-Oakes Nursery, Bismarck, ND.

Species Description: Skunkbush sumac is a deciduous, flowering native shrub. It grows 2 to 12 feet tall, but averages about 4 feet tall. It has a taproot and a fibrous root system. Roots are deep and extensively branched with somewhat shallow, spreading woody rhizomes. It sprouts readily from the root crown, especially after a severe disturbance. It is unlikely to reproduce vegetatively in the absence of disturbance. This sumac is reported to be dioecious. It is insect-pollinated. It reportedly has low seed production. It is estimated that only 5 to 15 percent of the flowers on the female plants actually produce seed. Acute drought may shorten twig growth and prevent fruit production. Sumac is tolerant of most soil textures, but prefers well-drained sites. It is intolerant of flooding and high-water tables.

Collection/Assembly: In September 1999, seed collections were made at 2 sites in the Cave Hills area of Harding County, SD. In September 2004, another collection was made, which was a composite of the two sites collected in 1999. In 2006, some collections were made in a number of locations, but possibly due to the drought, only small amounts were found. In South Dakota, seed was collected in Sully, Lyman, Todd, Ziebach, and Jones County. In North Dakota, seed was collected in Billings, Dunn, Slope, Golden Valley, and McKenzie County. One collection was also made in Powder River County, MT. In 2007, seed was collected in South Dakota from Corson and Sully Counties. North Dakota collections were from Dunn, McKenzie, Oliver, Slope, and Morton Counties.

Seedlings were grown of the Cave Hills collections. In the spring of 2001, only a few seedlings of 9082651 (north Cave Hills) were still alive. Survival of 9082653 (south Cave Hills) was much better. In 2003 seedlings of 9082653 were planted in the Off-Center Evaluation Planting sites at Dickinson and Apple Valley. They are performing well.

Beginning on February 5, 2008, the seed lots collected in 2006 and 2007 were treated for 65 minutes with sulfuric acid. Following the acid treatment, the seed was cold stratified for 30 days, and the moved to the greenhouse. Table SS-1 lists the dates and numbers of plants emerged for each seed lot. Seed lots collected from the northern edge of the skunkbush sumac range in North Dakota had very poor germination. R.E. Farmer Jr. (1997) states that "pollination failure ... may be a common occurrence on the northern edge of a species' range." In 2009, seedlings were maintained in the lathhouse. At the end of the growing season, most accessions were tall enough to be planted in 2010. The height varies from 9 inches to 21 inches.

Three-plant plots of 24 accessions of sumac were planted in three replications in May 2010 (see Figure SS-1). Most of these accessions were collected in 2006-2007. Several of the accessions planted in 2010 replaced original collections for which there were not sufficient plants. There were several other accessions that were short the minimum number of nine plants. Riverview Germplasm American black currant was used fill those few gaps in the planting. The sumac was evaluated in September 2010. Notes were taken on survival, height, width and the presence of leaf spot. With above average rainfall and humidity this year, most of the plants had some leaf spot in 2010. In future evaluations, leaf diseases and fruit amount should be rated. Sumac does often produce a lot of fruit. If heavier producers could be found, that would be something to select for.

Reference:

Farmer, R.E. Jr. 1997. Seed Ecophysiology of Temperate and Boreal Zone Forest Trees. DelRay, FL: St. Lucie Press. p.12

Table SS-1. Skunkbush sumac seed source study (seed stratification schedule, following sulphuric acid treatment)

lot #	accession	origin	insect holes in env.	medium	date start	date moved to greenhouse	date plants emerge	date of transplant	No.- April 1	Seed left (gr)	5/28/08 plants	Height Nov 08 (inches)
1	9092217	Corson Co., SD	x	potting soil	2/5/2008	3/11/2008	3/17/2008	3/31/2008	25	45.1	24	9
2	9092222	White Butte (Slope Co.)		potting soil	2/5/2008	3/11/2008	3/17/2008	3/31/2008	12	13.2	12	3.5
3	9092220	Sully Co., SD		potting soil	2/5/2008	3/11/2008	3/17/2008	3/31/2008	25	40	25	9
4	9092221	Arroda Lake (Oliver Co.)		potting soil	2/5/2008	3/11/2008					0	
5	BigHorn	Los Lunas PMC, NM		peat	2/5/2008	3/12/2008	3/18/2008	4/1/2008	13	25.6	13	10
6	9092218	Dunn Co., ND		peat	2/5/2008	3/12/2008	3/24/2008	4/1/2008	1		1	2.5
7	9092069	Powder River Co., MT	x	peat	2/5/2008	3/7/2008	3/12/2008	3/31/2008	25	11.6	25	2.5
8	9092128	Slope Co., ND	x	peat	2/6/2008	3/12/2008	3/20/2008	3/31/2008	5		5	4
9	9092068	McKenzie Co., ND		peat	2/6/2008	3/12/2008				3.4	1	2.5
10	9092067	Golden Valley Co., ND		peat	2/6/2008	3/12/2008	3/18/2008	4/1/2008	17	4	16	3
11	9092065	Jones Co., SD		peat	2/6/2008	3/14/2008	3/19/2008	4/1/2008	25	2	24	10
12	9092066	Billings Co., ND		peat	2/6/2008	3/14/2008	3/24/2008			7.5	8	5
13	9092064	Sully Co., SD		peat	2/6/2008	3/14/2008	3/20/2008	4/1/2008	25	10.4	20	5
14	9092058	Sully Co., SD		peat	2/6/2008	3/12/2008	3/18/2008	3/31/2008	25	16.7	25	7
15	9092059	Lyman Co., SD		peat	2/7/2008	3/18/2008	3/18/2008	4/1/2008	25	11.4	22	11
16	9092060	Todd Co., SD	x	peat	2/7/2008	3/20/2008	3/20/2008			4.8	14	9
17	9092130	Dunn Co., ND		peat	2/7/2008	3/19/2008	3/19/2008				9	2
18	9092063	Todd Co., SD	x	peat	2/7/2008	3/24/2008	3/24/2008	4/1/2008	25	15.3	25	8
19	9092062	Lyman Co., SD	x	peat	2/7/2008	3/11/2008	3/17/2008	3/31/2008	25	12.1	25	11
20	9092061	Ziebach Co., SD		peat	2/7/2008	3/14/2008	3/20/2008	4/1/2008	12		12	3
21	9092137	Dunn Co., ND		peat	2/7/2008	3/14/2008				3.6	0	
22	9092223	Morton Co., ND		peat	2/7/2008	3/14/2008	3/20/2008	4/1/2008	13		13	5
23	9092219	McKenzie Co., ND		peat	2/7/2008	3/14/2008	3/24/2008				10	8
24	9092129	Colorado		peat	2/7/2008	3/14/2008	3/20/2008	4/1/2008	1		1	19

Figure SS-1. Skunkbush sumac seed source study - plot layout



										NORTH				
	B	B	B	B	B	B	B	B	B	B	B	B	B	B
R	B	20	20	20	22	22	22	8	8	X	4	4	4	B
	B	17	17	X	14	14	14	3	3	3	9	9	9	B
O	B	13	13	13	10	10	10	7	7	7	6	6	6	B
	B	24	24	24	23	23	23	19	19	19	18	18	18	B
W	B	15	15	15	16	16	16	12	12	X	2	2	2	B
	B	11	11	11	5	5	5	21	21	21	1	1	1	B
E	B	16	16	16	10	10	10	23	23	23	14	14	14	B
	B	21	21	21	13	13	13	4	4	4	12	12	X	B
G	B	9	9	9	3	3	3	22	22	22	17	17	X	B
	B	18	18	18	6	6	6	7	7	7	24	24	24	B
I	B	19	19	19	15	15	15	5	5	5	20	20	20	B
	B	1	1	1	2	2	2	11	11	11	8	X	X	B
N	B	7	7	7	20	20	20	14	14	14	15	15	15	B
	B	10	10	10	19	19	19	23	23	X	6	6	6	B
W	B	4	4	4	21	21	21	17	17	X	13	13	13	B
	B	2	2	2	11	11	11	8	8	X	18	18	18	B
E	B	5	5	5	24	24	24	16	16	16	3	3	3	B
	B	9	9	9	22	22	22	12	12	X	1	1	1	B
S	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	B	B	B	B	B	B	B	B	B	B	B	B	B	B
X = American black currant replaces missing sumac plants														
B = border plants														

SELECTION AND INCREASE

SELECTION AND INCREASE: TECHNICAL REPORT – 2010

Promising Woody Plant Material

The following accessions show potential for further evaluation:

Genus/species	Accession Number	Origin	Remarks
Roundleaf hawthorn <i>Crataegus chrysocarpa</i>	9076678	5 South Dakota counties	Field plantings, seed increase
Bur oak <i>Quercus macrocarpa</i>	TBD, composite	Several states	Selected from ARS nursery
Chokecherry <i>Prunus virginiana</i>	TBD	TBD	NDSU breeding program
Chokecherry <i>Prunus virginiana</i>	9008183	Sheridan County, ND	Future uncertain
Black cherry <i>Prunus serotina</i>	9076737	Faribault and Anoka Counties, MN	Field plantings
Skunkbush sumac <i>Rhus trilobata</i>	TBD	TBD	Evaluation nursery
Fourwing saltbush <i>Atriplex canescens</i>	9082680	Jackson County, SD	Seed increase
Common ninebark <i>Physocarpus opulifolius</i>	9082891	IA (seed source)	Field plantings, from Big Sioux Nursery, Watertown, SD
White poplar <i>Populus alba</i>	9082892	MN, IA (seed source)	Field plantings

SELECTION AND INCREASE: TECHNICAL REPORT – 2010

Final Evaluation and Release Schedule

Genus/Species:	<i>Crataegus chrysoarpa</i>
Common Name:	hawthorn, roundleaf or fireberry
Accession/PI Number:	9076678
Source:	A composite of seed from selected native plants from 5 counties in South Dakota, including Butte, Marshall, Day, Hamlin, and Harding. The original plants were evaluated and selected from a large replicated nursery.
Outstanding characteristics:	Excellent survival on a variety of sites with excellent fruit production and a long life span
Anticipated Release Cooperators:	North Dakota, South Dakota, and Minnesota Agricultural Experiment Stations
Intended Use:	Wildlife and recreational plantings, farmstead windbreaks, and agroforestry applications such as fruit orchards

RELEASES

ANNOUNCING THE RELEASE OF

Riverview American Black Currant
SOURCE IDENTIFIED CLASS OF GERMPLASM

by the
UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

and the
MINNESOTA
AGRICULTURAL EXPERIMENT STATION

and the
NORTH DAKOTA
AGRICULTURAL EXPERIMENT STATION

and the
SOUTH DAKOTA
AGRICULTURAL EXPERIMENT STATION

The United States Department of Agriculture, Natural Resources Conservation Service; Minnesota Agricultural Experiment Station; North Dakota Agricultural Experiment Station; and South Dakota Agricultural Experiment Station announce the naming and release of a seed-propagated source identified class germplasm of American black currant (*Ribes americanum* Mill.).

As a source identified class germplasm release, this plant will be called **Riverview Germplasm American black currant**. There has been no genetic manipulation and it is considered a “natural-track” release. It has been assigned NRCS accession number 9082687. This alternative (germplasm) release procedure is justified because there are no varieties or sources of American black currant recommended for use in this area. The release is a native, local seed source from northeastern South Dakota. This shrub species is native to Minnesota, North Dakota, and South Dakota along moist drainages and streambanks in or on the edge of wooded areas. Riverview is suitable for many conservation and agroforestry uses, including riparian and wildlife plantings, farmstead and field windbreaks, single-row wind barrier plantings, fruit production, and ornamental/recreational plantings. Good windbreak and wildlife characteristics include ease of establishment, compact growth habit, and open branching which helps prevent snow breakage, and the fruit is a valuable food source for wildlife. The dark purple fruit is high in vitamins and antioxidants and can be used for human consumption. Riverview American black currant is adapted to a diverse array of sites. The crimson/gold fall color adds to its visual appeal and desirability in the landscape. The name Riverview was chosen to reference the riparian habitat where the fruit was originally collected within sight of the Big Sioux River.

Collection Site Information: Original seed was hand harvested from naturally occurring plants growing along the Big Sioux River near Watertown, South Dakota, in 1999, and 2001 through 2005. Harvest dates ranged from August 15 to September 4. Staff at Big Sioux Nursery collected seed from several locations approximately 5 miles apart along the floodplain of the river. This area is located in northeastern South Dakota (Codington County), Major Land Resource Area 102A, Rolling Till Prairie. Plant hardiness zone is 4a. Most of this area is in farms, and about 70 percent is cropland. Wooded areas generally are narrow bands along streams and rivers or are shelterbelts around farmsteads. Associated woody species are cottonwood, green ash, boxelder, hackberry, chokecherry, and golden currant. The nearly level to rolling topography has many wetland depressions. The average annual precipitation is 23 inches of which half or more falls during the growing season. The average freeze-free period is 120 days (USDA 1981). The first collection in 1999 was 9 pounds of fruit which yielded ½ pound of clean seed. Future collections of fruit yielded similar ratios of seed (18 to 1). Bareroot seedlings were first sold for conservation use by Big Sioux Nursery in 2001. Seed is planted in the fall. Seedlings are grown in the field for one year. They are dug in the fall and are usually 18 to 24 inches tall. Soils on the nursery are primarily loams with excellent drainage (Larson 2010).

Ecotype Description: *Ribes* is a genus of about 120 species with most abundance being in western North America and eastern Asia. American black currant is a native shrub species 3 to 6 feet tall with erect branches lacking spines on multiple stems. The simple, alternate leaves are 1 to 3 inches wide and gland-dotted beneath with 3 to 5 lobes. The glands are golden yellow in color. Small flowers open in late May and have 5 yellowish petals. Drooping racemes produce glossy red-purple to nearly black fruit in August-September. The globose berries are smooth and contain many seeds. Ripe fruits are sweet and desirable for human consumption. They are commonly eaten by birds and small mammals through the fall season (Stephens 1973, Rosendahl 1955, Stevens 1950). Most of the fruit is produced on 1 year-old wood so pruning back older growth will benefit fruit production. Fall leaf color can be shades of crimson and gold. Propagation is primarily from seed with some possible layering and basal sprouting. American black currant may form open thickets, but does not spread by suckering. Seedling vigor is good, and growth rate is medium. Lifespan is considered short to medium. It has moderate flood tolerance, but will not survive in permanent standing water. Black currant is considered highly drought tolerant. It occurs naturally as an understory species and is shade tolerant (USDA 2010). It is rated high in palatability by browsing animals, but the evaluation plots showed little damage. Chromosome number is $x=8$ and photosynthetic pathway is C_3 . There are approximately 313,000 seeds per pound.

Evaluation and Plant Performance: Bareroot seedlings were received by the Bismarck Plant Materials Center from Big Sioux Nursery beginning in 2001. Plant performance characteristics were evaluated at Off-Center Evaluation Plantings (OCEP) at five locations (Table 1) in Minnesota, North Dakota, and South Dakota from 2001 through 2009. Sites included four different Major Land Resource Areas. Soil textures varied from sand outwash to silty clay loam. Maintenance and weed control were good. The Brookings site had weed barrier for within row weed control. Survival was 100 percent at four of the locations. Plant vigor was rated good to excellent. Height and width are hard to compare because of the different ages, but width at all locations equaled or exceeded height. After seven growing seasons at Morris and Becker, plants averaged about 5.5 feet wide and 3.5 feet tall. No insect problems were noted. Disease symptoms (leaf spot/rust) were variable depending on the rainfall and other environmental conditions, but were generally rated moderate. A total of 20 field plantings in Minnesota (6), North Dakota (8), and South Dakota (6) were evaluated (Table 2). Field plantings are evaluations generally under actual field conditions with private landowners. Field conditions and maintenance varied greatly. Plantings were established in 2006 and 2007. Measurements were recorded in late summer by NRCS field office technicians. Field reviews of all planting sites were also conducted by Plant Materials Center and State Office staff during the summer and fall of 2009. Overall survival averaged 84 percent, even with heavier rates of weed competition in Minnesota. Vigor ratings

were rated good. Insects and disease were not a problem. There were minor instances of moderate leaf spot and rust. Generally, this seemed to depend on the planting site conditions. New sites with more air circulation had less disease than those established in existing tree plantings. Several field plantings had golden currant (*Ribes odoratum*) planted nearby and in all cases the leaves had already fallen in late summer because of leaf disease, compared to the American black currant where most plants were still in full leaf. Fruit production varied with site conditions and age of the plants. Generally, plants with good weed control had at least small amounts of fruit at 3 to 4 years of age. Plants growing in heavy weed/sod competition were surviving although vigor and growth were substantially reduced. Plantings in South Dakota had the best weed control and also the largest plants. Plants established for 3 and 4 years averaged 4.8 feet wide and 3.2 feet tall. Plants that were the same age in Minnesota and North Dakota averaged 2.4 wide and 2.4 tall.

Ecological Considerations: Riverview germplasm American black currant produces good fruit crops on adapted sites. Use of the berries by birds and other wildlife may spread seed and allow plants to become established off-site. The fruit persists well on the plant, but is usually used by wildlife before winter. No off-site movement of the plant was observed at any of the evaluation locations. The plant reproduces primarily by seed, but may form open thickets desirable for wildlife habitat. The species is native to the Northern Great Plains, Midwest, and the Northeastern United States. The compact growth habit, good fruit qualities, and attractive fall colors make it a desirable shrub species in most landscapes where woody vegetation is desired. It is easily controlled by mechanical or chemical means if necessary. It is not tolerant of fire. American black currant is reported to invade sedge meadows in Minnesota (Marshall 1995). This species does serve as an alternate host for the fungus that causes white pine blister rust, but is considered low risk to spread the rust (Van Arsdell et. al. 2002). The federal ban on European black currant (*Ribes nigrum*) was lifted in 1966 as rust-resistant cultivars were being developed. Riverview American black currant was documented as “OK to Release” when rated through the worksheet for “Environmental Evaluation of Plant Material Releases.”

Anticipated Conservation Use: The primary conservation use of Riverview American black currant is for planting in farmstead and field windbreaks, and in wildlife habitat and riparian areas. A secondary benefit is the edible fruit for home use or an alternative income crop. Fruit qualities and amounts would not be as great as compared to improved cultivars of the European black currant. The health food industry has been promoting black currant fruit products for the high content of antioxidants and vitamins.

Potential Area of Adaptation: This selection has performed well in numerous test plantings on diverse sites in North Dakota, South Dakota, and Minnesota. Adaptation is anticipated to be across regions of the Upper Midwest and Northern Great Plains on Conservation Tree and Shrub Groups 1, 3, 4, and 5. The best growth and fruit production occurs on moist, but well-drained sites in full sun. Good weed control improves overall plant performance.

Availability of Plant Materials: Limited quantities of breeder seed and seedling plants will be made available from the USDA Plant Materials Center at Bismarck, North Dakota, for nursery operators to establish seed orchards of Riverview germplasm American black currant. Conservation nurseries in the region sell bareroot seedlings.

References:

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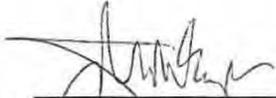
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Approvals for the release of Riverview germplasm American black currant, *Ribes americanum* (Mill.):



for Director, Ecological Sciences Division
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

9-21-2010

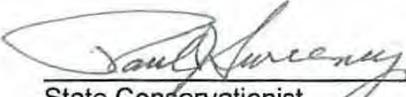
Date



State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Saint Paul, Minnesota

6-28-10

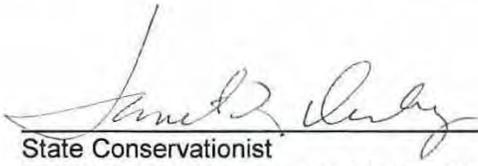
Date



State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Bismarck, North Dakota

5/19/10

Date



State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Huron, South Dakota

6/2/10
Date



Director
University of Minnesota
Agricultural Experiment Station
Saint Paul, Minnesota

7/27/10
Date



Director
North Dakota State University
Agricultural Experiment Station
Fargo, North Dakota

5/26/10
Date



Director
South Dakota State University
Agricultural Experiment Station
Brookings, South Dakota

3/6/10
Date

Riverview Germplasm American Black Currant Off-Center Evaluations (Table 1)								
<i>Evaluation Sites</i>	<i>*MLRA</i>	<i>*CTSGs/Texture</i>	<i>Survival %</i>	<i>Weed Comp. 1 = lowest 9 = highest</i>	<i>Average Vigor 1 = best 9 = poorest</i>	<i>Height (ft) (years)</i>	<i>Canopy (ft) (years)</i>	
Morris, MN; planted 2001, evaluated 2007	102A	4/silt clay loam	100	1	2	3.1 (7)	5.3 (7)	
Becker, MN; planted 2001, evaluated 2007	91	7/sand outwash	100	1	3	3.9 (7)	6.0 (7)	
Brookings, SD; planted 2004, evaluated 2008	102A	3/silt loam	100	1 (fabric)	3	3.8 (5)	6.2 (5)	
Bottineau, ND; planted 2007, evaluated 2009	55A	3/loam complex	100	3	3	1.5 (3)	1.6 (5)	
Dickinson, ND; planted 2007, evaluated 2009	54	5/fine sandy loam	80	3	3.3	2.0 (3)	2.0 (3)	
*MLRA = Major Land Resource Area; CTSGs = Conservation Tree and Shrub Groups								

Riverview Germplasm American Black Currant Field Planting Evaluations (Table 2)

<i>Established 2006 and 2007</i>	<i>Survival %</i>	<i>Weed Comp. 1 = lowest 9 = highest</i>	<i>Average Vigor 1 = best 9 = poorest</i>	<i>Height (ft)</i>	<i>Canopy (ft)</i>
Minnesota, average of 6 sites	80	5	3.3	2.3	2.3
North Dakota, average of 8 sites	89	2.8	2.8	2.4	2.4
South Dakota, average of 6 sites	83	2	2.8	3.2	4.8