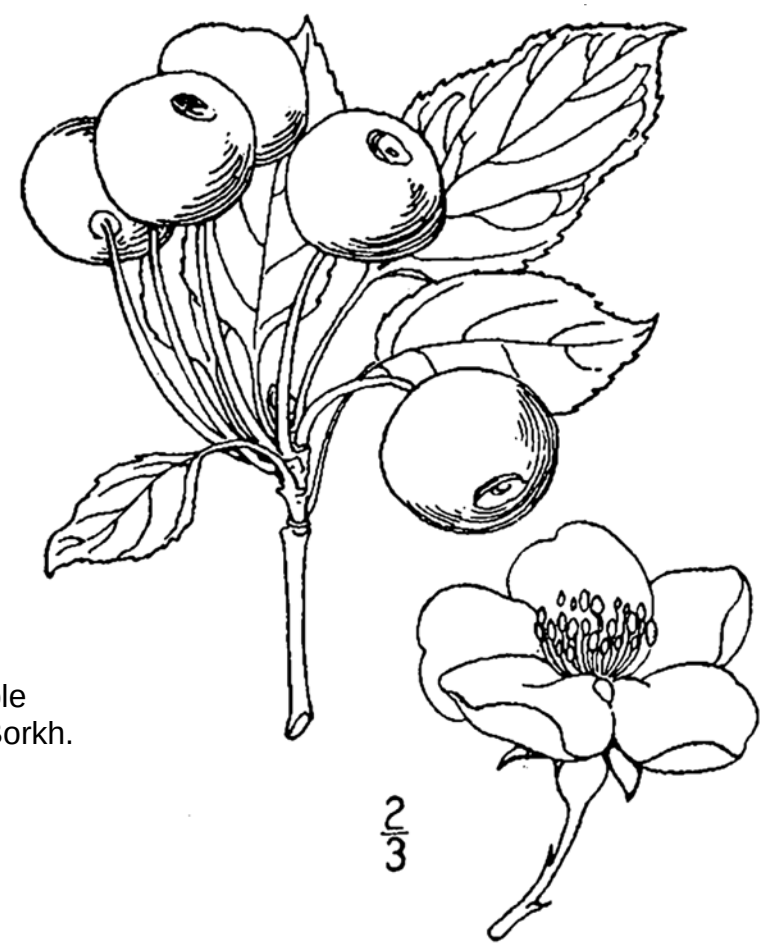
United States Department of Agriculture
Natural Resources Conservation Service

Plant Materials Center
Bismarck, North Dakota

Technical Report, 2009

Part 2 of 2: Trees and Shrubs



Manchurian crabapple
Malus baccata (L.) Borkh.

Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 2: 289. Courtesy of Kentucky Native Plant Society.

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

Technical Report

Trees and Shrubs

2009

Plant Materials Center Advisory Committee

J. R. Flores, State Conservationist, North Dakota
Janet L. Oertly, State Conservationist, South Dakota
William Hunt, State Conservationist, Minnesota

State Resource Conservationists

Todd A. Schwagler, North Dakota
Shaun T. Vickers, South Dakota
Paul A. Flynn, Minnesota

Plant Materials Specialist

Dwight A. Tober, Bismarck, North Dakota

Plant Materials Center Personnel

Wayne L. Duckwitz, Manager
Michael J. Knudson, Forester
Nancy K. Jensen, Agronomist
Earl G. Aune, Biological Technician (Foreman)
Michael D. Bellon, Biological Technician
Rachel H. Bergsagel, Biological Technician
Leslie A. Glass, Secretary
Sasha Bergsagel, Seasonal Biological Science Aid
Dennis DeVault, Seasonal Biological Science Aid
Chandra Heglund, Seasonal Biological Science Aid
Kyle Wolf, Seasonal Biological Science Aid

PART II

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INTRODUCTION

INTRODUCTION: TECHNICAL REPORT – 2009

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 bromegrass in grassed waterways.

Tree and Shrub Related Technology

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

Wetland and Riparian Plant Materials

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

Saline/Alkaline Tolerant Plant Materials

- Develop and distribute information.

Filter Strips/Nutrient Management

- Develop/promote effective plants for nutrient uptake.

Streambank and Lakeshore Stabilization

- Develop establishment and management protocol.

Information, Education, and Outreach

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

Alternative and Specialized Use of Conservation Plants

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

Urban Conservation

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

V. Partners and Cooperators

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

Approved by: Bismarck Plant Materials Center Advisory Committee

8/31/06

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

8/31/06

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

8-31-06

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

Location

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

Physical Facilities and Evaluation Sites

The PMC does not own land but manages a total of approximately 60 acres on Lincoln-Oakes Nursery. Six 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 70 acres of land located on the nursery. This site is primarily used by the PMC for foundation quality grass seed production. The PMC shares a building site with the Nursery, with the NRCS buildings located on the north part of the acreage. Buildings include an office, greenhouse, lathhouse, machine storage shed (housing tree and seed storage refrigeration units), seed cleaning building, chemical storage shed, and a second equipment storage building containing a small shop.

2. Off-center evaluation sites in Minnesota, South Dakota and North Dakota. These 6 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 2009 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: 2009 Weather Summary - Official Station - Bismarck, North Dakota

	Mean Temperature (degrees Fahrenheit)		Precipitation (inches) Actual		Deviation from Normal
Month	**2009**	**Normal***	**2009**	**Normal***	**2009**
January	8.7	10.2	0.83	0.45	0.38
February	13.5	18.1	0.78	0.51	0.27
March	21.5	29.7	2.73	0.85	1.88
April	41.2	43.3	0.69	1.46	-0.77
May	54.3	56.0	2.02	2.22	-0.20
June	61.4	64.7	7.94	2.59	5.35
July	66.9	70.4	3.15	2.58	0.57
August	66.8	69.0	0.58	2.15	-1.57
September	65.0	57.7	1.24	1.61	-0.37
October	39.5	45.2	2.21	1.28	0.93
November	38.1	28.0	0.04	0.70	-0.66
December	10.5	15.2	0.91	0.44	0.47
Annual	**40.6**	**42.3**	**23.12**	**16.84**	**6.28**

*National Climate Data Center 1971-2000 Monthly Normals

	2009
Last Frost (28 degrees)	16-May
First Frost (28 degrees)	8-Oct
Frost Free Period	144 days

REGIONAL DESCRIPTION

REGIONAL DESCRIPTION: TECHNICAL REPORT – 2009

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 australus*) are typical of lowland meadows and marshes. Western snowberry (*Symphoricarpos occidentalis*), rose (*Rosa*), buffaloberry (*Shepherdia argentea*), and chokecherry (*Prunus virginiana*) are abundant shrubs in draws and narrow valleys. Rocky Mountain juniper (*Juniperus scopulorum*) is common in the western Badlands. Eastern South Dakota, southern Minnesota, and the Red River Valley support vegetation dominated by tall grass prairie species; principally big bluestem, switchgrass (*Panicum virgatum*), and Indiangrass (*Sorghastrum nutans*). Other important species include little bluestem, prairie dropseed (*Sporobolus heterolepis*), porcupine grass (*Stipa spartea*), green needlegrass, and prairie cordgrass. Bur oak (*Quercus macrocarpa*), basswood (*Tilia americana*), hackberry (*Celtis occidentalis*), cottonwood (*Populus deltoides*), and willow (*Salix*) follow major draws and floodplains.

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

Climate and Species Adaptation

North Dakota and Minnesota are the two coldest States in the nation excluding Alaska. Mean annual temperatures range from 36 degrees F to 48 degrees F for all reporting stations. Plant hardiness zones (USDA) vary from 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.

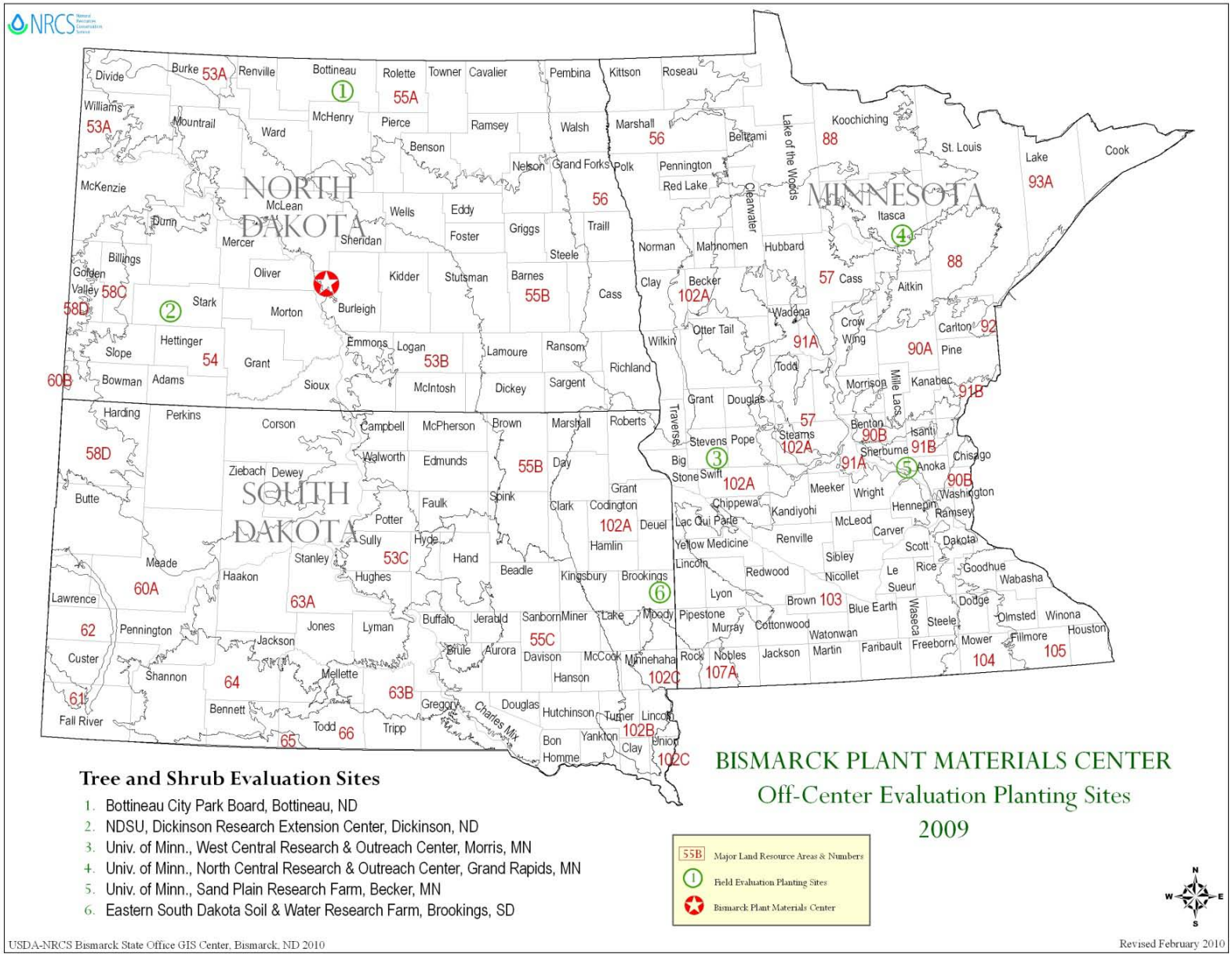
The diversity of woody species is limited because of cold and drought, especially in the Dakotas. The scarcity of native tall tree species for windbreaks has relegated at least a portion of the tree improvement effort in the Northern Great Plains to improving upon existing cultivars of native species 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


NRCS
NORTH DAKOTA
SOUTH DAKOTA
MINNESOTA
Tree and Shrub Evaluation Sites
1. Bottineau City Park Board, Bottineau, ND
2. NDSU, Dickinson Research Extension Center, Dickinson, ND
3. Univ. of Minn., West Central Research & Outreach Center, Morris, MN
4. Univ. of Minn., North Central Research & Outreach Center, Grand Rapids, MN
5. Univ. of Minn., Sand Plain Research Farm, Becker, MN
6. Eastern South Dakota Soil & Water Research Farm, Brookings, SD
BISMARCK PLANT MATERIALS CENTER
Off-Center Evaluation Planting Sites
2009
55B Major Land Resource Areas & Numbers
Field Evaluation Planting Sites
Bismarck Plant Materials Center
USDA-NRCS Bismarck State Office GIS Center, Bismarck, ND 2010
Revised February 2010

ASSEMBLY AND INITIAL EVALUATION

Off-Center Evaluation Plantings

OFF-CENTER EVALUATION PLANTINGS: TECHNICAL REPORT – 2009

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.

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 calcerous 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 2009 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 2009.

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. Block IV is located to the west of Block II, but is no longer evaluated. 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 2009. 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-seven accessions of 57 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:

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

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

Block II (95 feet long)				Row No.
North ---------->				
	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 ---------->		<---------- McDermand 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

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		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 5/09**

Table No. BO-1: 2009 Weather Summary - Official Station - Bottineau, North Dakota

	Mean Temperature (degrees Fahrenheit)		Precipitation (inches) Actual		Deviation from Normal
Month	**2009**	**Normal***	**2009**	**Normal***	**2009**
January	-0.8	3.0	0.66	0.49	0.17
February	7.4	10.5	1.11	0.46	0.65
March	13.7	22.9	0.68	0.79	-0.11
April	37.9	39.7	1.44	1.22	0.22
May	48.9	53.8	2.42	2.16	0.26
June	60.6	62.4	1.38	3.29	-1.91
July	63.7	66.7	2.82	3.04	-0.22
August	63.7	65.5	1.55	2.62	-1.07
September	63.8	54.4	1.75	1.94	-0.19
October	37.8	41.4	2.43	1.27	1.16
November	34.4	23.2	0.05	0.66	-0.61
December	4.2	8.5	0.99	0.51	0.48
Annual	**36.3**	**37.7**	**17.28**	**18.45**	**-1.17**

M = missing data

*National Climate Data Center 1971-2000 Monthly Normals

	2009
Last Frost (28 degrees)	16-May
First Frost (28 degrees)	9-Oct
Frost Free Period	145 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: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
sign	9082706	ROSA	prairie rose	16-May	03	03		5	5	100	4	1.0	0.9	
			Rosa			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	
II/I/1-5	9082712	CESC	bittersweet	14-May	02	02	PLBR	5	5	100	4	0.7	1.3	
			Celastrus scandens			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'	ACGI	amur maple	5-May	87	87	PLBR	5	4	80	4	0.9	1.6	
	PI-483442		*Acer ginnala*			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	JUNI	black walnut	6-May	85	85	PLBR	2	2	100	4	0.8	0.9	
	9005970		*Juglans nigra*			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: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
II/02/1-5	9047238	HIRH80	seaberry	5-May	87	87	PLBR	5	2	40	4	1.0	2.0	
			Hippophae rhamnoides			88			2	40	4	1.9	3.4	
			PFRA, Indianhead, Saskatchewan			89			2	40	4	1.6	3.2	
			Lincoln-Oakes Nursery, Bismarck, ND			91			4	80	3	2.2	3.1	
						93			4	80	4	3.5	4.8	
						96			5	100		5.1	6.4	heavy fruit crop, sprout
						02			4	80	2	12.5	9.8	
						06			3	60	4	15.0	11.2	
II/02/6-10	Survivor germplasm 9008041	AMFR	false indigo	5-May	87	87	PLBR	5	5	100	5	1.9	1.9	
			Amorpha fruticosa			88			3	60	3	3.6	3.0	
			USDA, SCS, PMC, Aberdeen, ID			89			3	60	3	4.1	3.5	
						91			5	100	3	5.7	4.3	
						93			5	100	3	5.0	5.0	
						96			5	100	2	11.8	8.5	solid
						01			5	100	3	14.5	6.0	
						06			5	100	4	12.0	10.0	many other volunteers
II/02/11-15	9047236	AMFR	false indigo	5-May	87	87	PLBR	5	5	100	4	1.2	1.9	
			Amorpha fruticosa			88			5	100	4	2.4	2.4	
			Lincoln-Oakes Nursery,			89			5	100	3	3.9	2.9	
			Bismarck, ND			91			5	100	3	6.5	3.3	
						93			5	100	4	6.9	4.3	
						96			5	100	3	11.8	6.1	
						01			5	100	3	14.5	6.0	
						06			1	20	4	12.0	5.5	overgrown chokecherry
II/02/16-20	ND-170 9005728	COIN16	European cotoneaster	8-May	90	90	CONT	5	5	100		0.5	1.0	
			Cotoneaster integerrimus			91			5	100	3	1.5	1.8	
			USDA, SCS, PMC, Bismarck, ND			92			5	100	3	2.1	2.2	4 plts have fruit
						94			5	100	3	3.8	3.1	
						96			5	100	2	6.6	3.8	heavy fruit crop
						99			5	100	2	8.2	4.9	
						04			5	100	1	12.5	6.2	
						09			5	100	3	11.0	6.8	

Project No.: 38I308K Field Evaluation of Woody Plant Materials, Bottineau, North Dakota
Year of Record: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
II/03/1-10	ND-21	VILE	nannyberry	5-May	86	86	PLBR	10	10	100	3	0.3	0.6	
	9034900		*Viburnum lentago*			87			5	50	4	0.5	1.2	
	PI-560908		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	
II/04/1-5	'Meadowlark'	FOOV80	forsythia	8-May	89	89	PLBR	5	5	100	7	0.2	0.5	
	9005886		*Forsythia ovata X europaea*			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	88	PLBR	5	0	0				
			Corylus americana			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	BEKO	Korean barberry	10-May	88	88	CONT	5	0	0				
	9019577		*Berberis koreana*			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	

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PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
II/05/1-5	'McKenzie'	PHME13	black chokeberry	10-May	88	88	CONT	5	0	0				drought
	PI-323957		*Photinia melanocarpa*			89			5	100		0.6	1.5	
			P.I. Sta., Ames, IA			90			5	100	3	1.1	1.4	
			USDA, SCS, PMC, Bismarck, ND			92			5	100	3	1.8	1.8	
						94			5	100	2	2.6	2.9	2 plants have fruit
						97			5	100	6	3.7	2.1	dieback on all plants
						02			5	100	3	4.0	5.3	
						07			5	100	3	5.5	5.5	
II/05/6-10	ND-2106	PRUNU	hardy almond	8-May	90	90	CONT	5	2	40		0.6	0.8	
	9047151		*Prunus*			91			2	40	4	1.6	1.6	
			USDA, SCS, PMC, Bismarck, ND			92			2	40	4	1.7	1.6	
						94			2	40	3	2.8	3.1	
						96			2	40	4	4.5	4.0	
						99			2	40	4	5.2	4.6	
						04			2	40	2	8.5	7.0	
II/05/11-15	'Magenta'	MALUS	crabapple	12-May	92	92	PLBR	5	3	60	7	0.3	0.6	
	PI-514275		*Malus*			93			4	80	5	0.9	1.4	
			USDA, SCS, PMC, E. Lansing, MI			94			5	100	5	0.9	1.8	
						96			5	100	4	2.9	3.6	
						98			5	100	5	4.1	5.0	
						01			4	80	3	7.9	9.0	
						06			4	80	3	8.8	10.6	
II/06/1-5	'Midwest'	MAMA37	Manchurian crabapple	27-Apr	82	82	PLBR	5	5	100	3	1.5	2.2	
	9006003		*Malus mandshurica*			83			4	80	3	3.4	3.9	good vigor
	PI-478000		Res. Sta., Morden, MB, Canada			84			4	80	3	5.0	5.0	spring frost damage
			USDA, SCS, PMC, Bismarck, ND			86			4	80	3	8.2	6.9	
						88			4	80	3	10.8	8.5	
						91			3	60	3	13.8	10.4	
						96			3	60	2	17.4	12.4	
						01			3	60	3	24.0	14.5	
						06			3	60	4	18.0	15.0	

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II/06/6-10	9063098	JUNI	black walnut	6-May	91	91	PLBR	5	5	100	4	1.0	1.8	
			Juglans nigra			92			5	100	4	0.7	2.2	Tubex on all
			Big Sioux Nursery, Watertown, SD			93			5	100	4	1.2	3.0	
						95			5	100	3	2.5	4.3	
						97			5	100	3	3.0	5.0	
						00			5	100		6.4	9.5	Tubex removed
						05			5	100	4	11.8	12.8	
II/07/1-5	'Freedom'	LOKO	honeysuckle	8-May	90	90	PLBR	5	5	100	4	1.3	1.5	
	9057424		*Lonicera korolkowii*			91			5	100	3	4.4	4.0	
			Lincoln-Oakes Nursery, Bismarck, ND			92			5	100	3	4.1	3.4	all have fruit, all have
						94			5	100	2	5.6	6.6	some tip dieback
						97			5	100	5	11.3	8.9	
						99			5	100		11.8	10.5	
						04			5	100	3	17.0	12.0	slight dieback
						09			5	100	3	17.0	13.3	
II/7/6-10	9057406	RORU	rugosa rose	14-May	02	02	CONT	5	5	100	5	0.6	1.2	
			Rosa rugosa			03			2	40	8	0.2	0.4	
			Lincoln-Oakes Nursery, Bismarck, ND			04			2	40	7	0.4	0.8	
						06			2	40	6	0.6	0.8	
						09			0	0				poor survival
II/7/6-10	9087732	QUMA	bur oak	11-May	09	09		5	5	100	3	1.0	2.1	
			Quercus macrocarpa											
			USDA, NRCS, PMC, Bridger, MT											
II/08/1-5	9063141	PODE3	eastern cottonwood	11-May	93	93	PLBR	5	5	100	3	1.3	3.0	
			Populus deltoides			94			5	100	3	3.2	5.6	
			Lincoln-Oakes Nursery, Bismarck, ND			95			5	100	1	6.7	9.9	
						97			5	100	2	9.3	16.3	
						99			5	100		10.8	23.2	
						02			5	100	4	11.5	20.8	
						07			2	40	3	17.8	35.9	

Project No.: 38I308K Field Evaluation of Woody Plant Materials, Bottineau, North Dakota
Year of Record: 2009

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II/08/6-10	9030611	POAL7	white poplar	11-May	93	93	CONT(P)	5	3	60	5	1.4	1.2	plt 3,4 had competition from
	ND-3796		*Populus alba*			94			2	40	4	1.3	2.3	apricot sprouts
			Turner Co., SD			95			2	40	2	6.2	5.8	
			McKenzie FEP, ND			97			2	40	2	6.5	8.7	
						99			2	40	3	13.6	17.2	
						02			2	40		11.0	17.6	
						07			2	40		14.0	24.1	
II/09/1-5	'McDermand'	PYUS2	Ussurian pear	6-May	81	81	CONT	5	5	100	4	0.9	2.0	
	ND-14		*Pyrus ussuriensis*			82			5	100	4	2.3	3.5	
	9006095		Res. Sta., Morden, MB, Canada			83			5	100	4	2.6	5.2	
	PI-478004					85			5	100	4	5.5	8.1	
						87			5	100	4	7.2	10.4	
						88			5	100	4	9.7	11.2	
						90			5	100	3	9.8	11.8	
						95			5	100	4	11.7	17.0	
						00			5	100	3	14.4	18.6	
						05			5	100	3	17.0	18.6	
II/09/6-11	9091967		pin cherry	13-May	08	08		5	4	80	4	0.8	1.8	
			Prunus pensylvanica			09			5	100	6	0.6	1.1	1 top all dead
			Big Sioux Nursery, Watertown, SD											
II/10/1-5	'Cardan'	FRPE	green ash	6-May	81	81	CONT	5	5	100	3	1.3	3.0	
	9005895		*Fraxinus pennsylvanica*			82			5	100	3	3.9	5.7	
	PI-469226		Carlyle, MT			83			5	100	4	5.0	7.0	severe ash plant bug
						85			5	100	3	8.4	11.5	
						87			5	100	3	10.9	14.4	
						90			5	100	4	11.1	16.3	
						95			5	100	3	11.5	20.0	
						00			5	100	3	13.5	24.3	
						05			5	100	2	24.6	28.7	
						06			5	100	2	18.0	26.7	

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II/10/6-10	ND-1759	FRPE	green ash	6-May	81	81	PLBR	5	5	100	3	1.3	2.8	
	9005893		*Fraxinus pennsylvanica*			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	
II/11/1-5	ND-3207	FRPE	green ash	27-Apr	82	82	PLBR	5	5	100	3	1.1	3.8	
	9011849		*Fraxinus pennsylvanica*			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	SYREP	pekin lilac	27-Apr	82	82	PLBR	5	2	40		1.1	1.2	
	9006225		*Syringa reticulata* ssp. *pekinensis*			83			2	40	5	1.9	2.4	
	PI-478008		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	

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II/12/1-5	ND-3779	POLA82	Manchurian poplar	27-Apr	82	82	CONT	5	5	100	3	3.1	4.2	
	9029137		*Populus laurifolia*			83			5	100	1	5.9	8.6	good-excellent growth and
			Lee Nursery, Fertile, MN			84			5	100	1	8.3	14.0	vigor
						86			5	100	2	11.2	19.5	
						88			5	100	3	12.8	22.3	
						91			5	100	4	13.5	25.2	
						96			5	100	3	15.7	30.7	
						01			5	100	3	20.0	35.0	
						06			2	40	4	19.8	37.1	
II/12/6-10	'Raverdeau'	POPUL	hybrid poplar	12-May	93	93	PLBR	5	5	100	3	1.0	3.0	
	9069085		*Populus*			94			5	100	3	1.6	4.7	
			Lee Nursery, Fertile, MN			95			5	100	3	5.1	7.8	
						97			5	100	3	6.9	13.0	
						99			5	100	3	9.3	23.0	
						02			5	100	4	10.2	24.3	
						07			5	100	6	10.0	22.0	
II/13/1-5	9069081	TICO2	littleleaf linden	12-May	93	93	PLBR	5	5	100	5	0.8	1.2	
			Tilia cordata			94			4	80	4	1.5	1.7	
			Lee Nursery, Fertile, MN			95			5	100	3	2.5	1.9	
						97			3	60	5	2.6	2.0	
						99			3	60	4	3.8	4.6	
						02			3	60	5	6.5	5.8	
II/13/6-10	9008183	PRVI	common chokecherry	3-May	05	05	PLBR	5	5	100	5	0.7	1.9	
			Prunus virginiana			06			5	100	4	1.2	2.3	
			Lincoln-Oakes Nursery, Bismarck, ND			07			4	80	3	2.2	4.4	
						09			4	80	3	3.9	6.6	
II/14/1-5	Prairie Harvest Germplasm	CEOC	hackberry	11-May	09	09			4	80	5	0.4	1.3	all appear to have tips damaged
	9034956		*Celtis occidentalis*											
	ND-3878		Polk County, Minnesota											

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II/14/6-10	'Assiniboine'	POPUL	hybrid poplar	12-May	93	93	PLBR	5	4	80	6	0.5	1.6	
	9063147		*Populus*			94			5	100	5	1.0	2.8	
			PFRA, Indianhead, Saskatchewan			95			5	100	3	2.8	4.4	
						97			4	80	5	4.3	7.5	
						99			4	80	4	5.0	15.1	
						02			4	80	4	6.5	18.4	
						07			3	60	4	10.3	24.2	
II/15/1-5	'Oahe'	CEOC	hackberry	11-May	09	09		5	2	40	4	0.9	1.0	
			Celtis occidentalis											
II/16/1-5	9069060	POTR5	quaking aspen	12-May	93	93	PLBR	5	0	0				did not establish
			Populus tremuloides			94			5	100	4	1.1	3.1	replants
			Lee Nursery, Fertile, MN			95			4	80	2	3.3	5.2	
						97			4	80	2	3.8	6.6	
						99			4	80	3	5.1	11.0	
						02			4	80	3	6.1	14.2	
						07			3	60	3	8.3	18.8	
II/16/6-10	ND-3898	PYUS2	Ussurian pear	25-May	83	83	PLBR	5	1	20	5	0.3	1.5	
	9035208		*Pyrus ussuriensis*			84			4	80	5	0.9	1.2	
			Lawyer Nursery, Plains, MT			85			5	100	4	1.1	2.3	
						87			3	60	3	4.2	5.9	
						89			3	60	4	5.4	7.3	
						92			3	60		9.0	10.7	
						97			3	60	8	15.9	13.1	
						02			3	60	5	12.2	14.2	
						07			3	60		13.0	15.0	

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II/17/1-5	ND-3825	ACSA2	silver maple	25-May	83	83	CONT	5	5	100	5	0.3	1.0	
	9034904		*Acer saccharinum*			84			5	100		0.4	1.1	
			Bismarck, ND			85			3	60	5	0.8	2.1	
						86			2	40	2	2.2	4.6	
						87			4	80	4	3.5	4.7	
						89			2	40	6	4.6	5.7	
						92			2	40	4	9.5	11.2	
						97			2	40	5	21.0	17.6	
						02			2	40	5	20.5	18.4	
						07			2	40	6	20.0	15.0	
II/17/6-10	9057410	CEOC	hackberry	10-May	88	88	CONT	5	4	80		0.3	0.7	
			Celtis occidentalis			89			1	20		0.7	0.8	
			Bottineau Co., ND			90			5	100		0.6	1.1	
			NDFS			92			5	100	4	1.5	2.8	Tubex on 4 of trees
						94			5	100	4	3.4	4.6	
						97			5	100	3	6.8	9.0	
						02			5	100		8.8	13.6	
						07			5	100		12.6	16.8	
II/18/1-5	9057412	QUMA2	bur oak	10-May	88	88	CONT	5	1	20		0.5	1.0	
			Quercus macrocarpa			89			1	20		0.5	0.7	
			Foster Co., ND			90			5	100	7	0.4	0.9	
			NDFS			92			4	80	7	0.5	1.0	
						94			4	80	4	1.1	1.9	
						97			4	80	2	1.8	4.0	
						02			4	80	4	7.0	8.8	
						07			4	80	3	8.8	12.4	
II/19/1-5	9063116	FRNI	black ash	5-May	94	94	CONT	5	5	100	4	0.9	1.4	
			Fraxinus nigra			95			5	100	3	1.6	3.6	
			Itasca State Park, MN			96			5	100	3	2.2	4.8	
						99			5	100	5	2.6	7.5	
						00			5	100	3	2.4	8.8	
						03			5	100	3	4.3	12.6	
						08			4	80	2	8.2	18.2	

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II/19/6-10	9063115	FRPE	green ash	5-May	94	94	CONT	5	5	100	4	0.7	1.3	
			Fraxinus pennsylvanica			95			5	100	3	1.4	2.9	
			Itasca State Park, MN			96			5	100	4	2.2	4.0	cut off
						99			5	100	5	3.3	6.3	
						00			5	100	5	3.8	8.1	
						03			5	100	2	6.9	13.3	
						08			5	100	3	11.4	19.7	
III/01/1-5	9069164	PISYM	Scots pine	14-May	02	02	CONT	5	3	60	3	1.0	2.4	
			Pinus sylvestris var. *mongolica*			03			4	80	4	1.0	2.4	
			People's Republic of China, Heilongjiang Province			04			4	80	3	1.3	3.0	
						06			5	100	4	1.9	3.8	
						08			5	100	4	2.8	4.8	
III/02/1-5	9076719	PISYM	Scots pine	14-May	02	02	CONT	5	3	60	3	1.0	2.2	
			Pinus sylvestris var. *mongolica*			03			4	80	4	0.7	2.3	
			People's Republic of China, Heilongjiang Province			04			2	40	4	0.6	2.9	
						06			4	80	4	1.3	3.2	
						08			2	40	4	1.9	4.0	
III/03/1-5	9076718	PISYM	Scots pine	14-May	02	02	CONT	5	3	60	3	1.4	2.2	
			Pinus sylvestris var. *mongolica*			03			5	100	3	1.1	2.5	
			People's Republic of China, Heilongjiang Province			04			5	100	3	1.1	3.0	
						06			4	80	3	2.8	5.1	
						08			3	60	2	3.5	6.2	
III/04/1-3	ND-81	PRSP	sloe	24-May	78	78	PLBR	3	2	67	3	0.8	1.2	
	9006078		*Prunus spinosa*			79			2	67	3	2.1	2.0	
			Res. Sta., Morden, MB, Canada			80			2	67	6	2.1	1.7	
						82			2	67	5	4.3	5.2	
						83			2	67	4	5.2	6.0	mildew
						84			2	67	5	5.9	6.2	
						87			2	67		8.5	7.9	
						92			2	57	5	6.4	7.4	
						97			1	33	4	14.4	10.3	
						02			1	33	3	15.0	9.5	
						07			1	33	3	17.0	12.0	

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III/05/1-5	'Bighorn'	RHTR	skunkbush sumac	24-May	79	79	PLBR	5	4	80		0.4	0.8	
	WY-843		*Rhus trilobata*			80			4	80	4	2.5	3.0	
	9004646		Bighorn Co., WY			81			4	80	4	5.2	3.9	
	PI-483445		USDA, SCS, PMC, Bismarck, ND			83			2	40	5	7.9	5.0	
						85			2	40	2	8.7	4.9	
						88			2	40	3	11.5	7.5	
						93			2	40		16.4	7.7	
						98			2	40	6	15.9	8.4	
						09			0	0				shaded out
III/06/1-8	ND-26	LONIC	honeysuckle	24-May	79	79	PLBR	8	8	100		1.4	1.5	
	9011852		*Lonicera*			80			8	100	5	2.3	2.6	
			USDA, ARS, Mandan, ND			81		9	9	100	5	3.7	4.0	
						83		8	8	100	4	5.6	5.7	excellent fruit,
						85			8	100	3	7.9	7.1	slight honeysuckle aphid,
						88			8	100	4	9.0	8.2	witches broom, mildew
						93			7	88		14.6	9.5	
						98			7	88	5	13.5	10.2	
						03			7	88		10.8	11.0	
						08			8	100	4	19.0	10.5	
III/07/1-10	ND-11	LOMA6	amur honeysuckle	6-May	81	81	CONT	10	10	100	5	1.6	1.5	
	9005993		*Lonicera maackii*			82			10	100	4	3.7	3.0	
	PI-477998		Res. Sta., Morden, MB, Canada			83			10	100	4	4.1	3.5	leaf wilt,
						85			10	100	3	5.9	4.7	leaf scorch
						87			10	100	3	8.2	7.0	
						88			10	100	3	7.7	6.3	
						90			10	100	4	9.2	6.8	
						95			10	100	3	9.8	8.3	
						00			10	100	4	11.9	9.8	
						05			10	100	3	11.2	10.5	

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III/08/1-10	'Regal'	PRTE5	Russian almond	6-May	81	81	CONT	10	10	100	4	1.2	2.5	
	ND-283		*Prunus tenella*			82			10	100	4	3.1	3.4	
	9006079		NDG&F Dept.			83			10	100	3	3.9	3.8	
	PI-540442					85			10	100	4	5.9	5.0	
						87			10	100	4	7.4	5.3	
						88			10	100	4	7.9	5.3	
						90			10	100	3	7.9	5.6	
						95			10	100	3	11.3	6.1	
						00			10	100	3	13.5	7.3	
						05			10	100	2	15.4	6.6	
III/09/1-5	9082684	RHGL	smooth sumac	16-May	03	03		5	2	40	5	0.8	1.0	poor stock
			Rhus glabra			04			2	40	3	0.7	1.5	
			Lincoln-Oakes Nursery, Bismarck, ND			05			2	40	4	0.7	1.4	
						07			1	20	7	0.5	1.5	
						09			0	0				removed
III/09/6-10	9082738	CORA6	gray dogwood	6-May	03	03		5	5	100	4	0.7	1.5	
			Cornus racemosa			04			5	100	3	0.7	1.9	
			Wisconsin			05			5	100	3	1.0	2.0	
			Lincoln-Oakes Nursery, Bismarck, ND			07			5	100	4	1.0	1.7	
						09			5	100	4	1.2	1.3	
III/10/1-5	'Arnolds Red'	LOTA	red tatarian honeysuckle	12-May	93	93	PLBR	5	4	80	4	1.0	1.5	
	9069080		*Lonicera tatarica*			94			4	80	4	1.6	2.1	
			Lee Nursery, Fertile, MN			95			5	100	4	2.5	3.1	
						97			5	100	4	3.9	4.6	
						99			5	100	4	4.3	5.4	
						02			5	100	4	5.5	6.9	alot of fruit on all
						07			5	100	4	9.0	9.6	

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III/10/6-10	9063143	LOTA	red tatarian honeysuckle	12-May	93	93	PLBR	5	5	100	4	1.2	1.4	
			Lonicera tatarica			94			5	100	5	1.2	1.9	
			Iowa			95			5	100	4	3.5	3.7	
			Lincoln-Oakes Nursery, Bismarck, ND			97			5	100	3	5.3	5.5	
						99			5	100	2	6.0	7.3	
						02			5	100	2	7.5	8.8	
						07			5	100	2	11.5	10.5	
III/11/1-5	9069129	PRMA80	Amur chokecherry	11-May	94	94	PLBR	5	3	60	2	1.9	3.2	
			Prunus maackii			95			5	100	2	3.3	5.1	
			Big Sioux Nursery, Watertown, SD			96			5	100	3	5.1	6.6	
						98			5	100	2	6.6	8.2	
						00			5	100	1	6.2	12.3	
						03			5	100	2	11.7	13.1	
						08			4	80	5	13.5	12.4	
III/11/6-10	9069128	LOTA	red tatarian honeysuckle	11-May	94	94	PLBR	5	4	80	5	1.0	1.0	
			Lonicera tatarica			95			5	100	4	2.9	3.1	
			Big Sioux Nursery, Watertown, SD			96			5	100	4	3.4	4.7	herbicide damage
						98			5	100	3	5.8	7.1	
						00			5	100	2	5.3	10.7	
						03			5	100	4	8.6	12.7	
						08			5	100	2	11.0	14.0	
III/12a/1-5	9082747	VIOPA	American cranberrybush		07	07	POTD	5	4	80	5	0.5	0.9	
			Viburnum opulus var. *americanum*			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		black currant		07	07	CONT	5	5	100	3	0.8	1.2	
			Ribes americanum			08			5	100	3	1.6	1.5	
			South Dakota			09			5	100	3	1.4	1.3	
			Big Sioux Nursery, Watertown, SD											

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III/12b/6-10	9091964		skunkbush sumac		07	07	CONT	5	5	100	3	0.9	1.3	weed competition 3,4
			Rhus trilobata			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/13/6-10	9076686	CRCH	roundleaf hawthorn	26-May	04	04		5	5	100	4	0.4	0.7	caged
			Crataegus chrysocarpa			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	
III/14/1-5	9082885	POTR5	quaking aspen	26-May	04	04		5	5	100	4	0.3	2.2	
			Populus tremuloides			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	
III/14/1-5	9094281	VIOPA	American cranberrybush	11-May	09	09		5	5	100	5	0.9	1.1	
			Viburnum opulus var. *americanum*											
			Minnesota											
			Big Sioux Nursery, Watertown, SD											
III/14/6-10	90911969	CAFR80	Russian peashrub	3-May	05	05		5	5	100	3	0.7	3.1	
			Caragana frutex			06			5	100	4	0.8	3.0	
			Big Sioux Nursery, Watertown, SD			07			5	100	4	1.0	3.2	
						09			5	100	4	1.1	3.2	
III/15/1-5	'Indigo'	COAM2	silky dogwood	25-May	83	83	PLBR	5	5	100	4	0.7	1.3	
	Mich-765		*Cornus amomum*			84			5	100	4	2.0	1.9	
	9004971		USDA, SCS, PMC, Rose Lake, MI			85			5	100	3	3.0	3.0	
	PI-468117					87			4	80	4	6.2	4.3	
						89			4	80	4	5.0	4.5	
						92			4	80	5	5.6	4.9	
						97			4	80	4	9.8	7.2	
						02			4	80	3	10.5	8.3	
						07			4	80		11.5	8.0	

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III/15/6-10	ND-3889	COST4	dogwood	25-May	83	83	PLBR	5	4	80	6	0.5	1.1	
	9035199		*Cornus stolonifera*			84			3	60	4	0.9	1.8	
			Lawyer Nursery, Plains, MT			85			3	60	3	2.7	2.7	
						87			3	60	4	5.7	3.7	
						89			2	40	4	5.8	4.4	
						92			2	40	2	7.6	5.8	
						97			2	40	2	7.6	5.8	
						02			3	60	4	10.5	6.3	
						07						13.0	5.5	a thicket, cannot see individuals
III/16/6-10	ND-3888	COAC*	cotoneaster	25-May	83	83	PLBR	5	5	100	4	1.0	1.4	
	9035198		*Cotoneaster acutifolia*			84			5	100	4	1.5	1.9	
			Lawyer Nursery, Plains, MT			85			5	100	4	2.4	2.9	
						87			5	100	4	5.5	4.3	
						89			5	100	3	6.0	5.3	
						92			5	100	3	9.8	7.0	
						97			5	100	5	8.9	7.5	
						02			5	100	3	11.0	9.7	
						07			5	100	3	11.0	8.0	some dieback but lots of fruit
III/17/1-5	ND-3887	CAAR18	caragana	25-May	83	83	PLBR	5	5	100	4	0.5	1.3	
	9035197		*Caragana arborescens*			84			5	100	5	0.8	1.9	
			Lawyer Nursery, Plains, MT			85			5	100	4	1.4	2.8	
						87			4	80	4	4.3	6.2	
						89			5	100	4	5.2	7.1	
						92			5	100	3	7.3	9.8	
						97			5	100	3	14.6	13.1	
						02			5	100	3	15.5	14.8	
						07			5	100	4	17.0	16.5	leggy

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Year of Record: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
III/17/6-10	ND-3892	LOTA	red tatarian honeysuckle	25-May	83	83	PLBR	5	5	100	6	0.6	1.2	
	9035202		*Lonicera tatarica sibirica*			84			5	100	5	1.1	1.9	leaf wilt, aphid
			Lawyer Nursery, Plains, MT			85			5	100	3	2.3	2.7	
						87			5	100	4	5.3	5.2	
						89			5	100	4	6.1	6.2	
						92			5	100	4	6.8	8.5	
						97			5	100	4	14.3	10.9	
						02			5	100	4		12.8	
						07			5	100	4	19.0	15.3	
III/18/1-5	ND-3893	PRAM	American plum	25-May	83	83	PLBR	5	4	80	6	0.5	1.8	
	9035203		*Prunus americana*			84			5	100	5	0.9	1.8	
			Lawyer Nursery, Plains, MT			85			5	100	4	1.2	2.4	
						87			5	100	4	4.8	5.6	
						89			5	100	4	6.9	7.8	
						92			5	100	3	8.3	9.5	
						97			5	100	4	15.5	12.3	
						02			5	100	5	15.0	13.5	
						07			5	100	3	18.0	11.8	
III/19/1-5	'Centennial'	COIN16	European cotoneaster	6-May	85	85	PLBR	5	5	100	3	0.6	1.1	
	ND-177		*Cotoneaster integerrimus*			86			5	100	3	1.8	2.3	
	9005729		USDA, SCS, PMC, Bismarck, ND			87			5	100	3	4.4	3.6	
	PI-113095					89			5	100	4	5.9	5.4	
						91			4	80	3	10.8	6.6	
						94			4	80	3	11.8	8.7	
						99			3	60	4	9.6	10.4	
						04			5	100	6	11.0	9.0	fireblight
						09			1	20	3	13.0	9.8	

Project No.: 38I308K Field Evaluation of Woody Plant Materials, Bottineau, North Dakota
Year of Record: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
III/19/6-10	ND-3896	PRTO80	nanking cherry	25-May	83	83	PLBR	5	3	60	8	0.3	0.5	poor quality stock,
	9035206		*Prunus tomentosa*			84			4	80	6	0.3	0.9	failed to establish,
			Lawyer Nursery, Plains, MT			85			4	80	3	0.7	1.3	5 cultivated out
						87			2	40	4	3.0	4.0	
						89			2	40	3	4.4	5.2	
						92			2	40	4	7.0	5.6	
						97			2	40	6	6.9	5.0	
						02			2	40	4	9.0	8.5	
						07			2	40	5	7.0	7.0	
III/20/1-5	ND-3900	SYVI3	late lilac	25-May	83	83	CONT	5	5	100	8	0.3	1.0	heat stress,
	9035210		*Syringa villosa*			84			3	60	9	0.4	0.8	poor quality stock
			Lawyer Nursery, Plains, MT			85			4	80	4	0.5	1.2	
						86			5	100	3	1.3	1.9	
						87			3	60				
						89			5	100	4	2.4	3.2	
						92			4	80	4	4.6	5.6	
						97			4	80	4	10.2	8.5	
						02			4	80	4	9.5	10.5	
						07			4	80	3	10.0	11.5	
III/20/6-10	ND-3901	SYVU	common lilac	25-May	83	83	CONT	5	5	100	8	0.3	0.5	severe weed competition,
	9035211		*Syringa vulgaris*			84			4	80	7	0.3	0.5	moisture stress,
			Lawyer Nursery, Plains, MT			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	

Project No.: 38I308K Field Evaluation of Woody Plant Materials, Bottineau, North Dakota
Year of Record: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
III/21/1-5	'Prairie Red'	PRUNU	plum	6-May	85	85	PLBR	5	3	60	6	0.4	1.6	
	ND-1134		*Prunus*			86			3	60	4	1.1	2.3	
	9047203		Miller, SD			87			2	40	4	2.7	3.2	
			USDA, SCS, PMC, Bismarck, ND			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	

Below is the 2009 annual progress report, a stand-alone publication, for this study.

2009 Report
Off-Center Evaluation Planting of Woody Plant Materials Bottineau, North Dakota

Mike Knudson, Forester
Rachel Bergsagel, Biological Science Technician
USDA-NRCS, Plant Materials Center, Bismarck, North Dakota

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 six 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 Mike Knudson 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

A number of new trees were planted on May 11, 2009, including the following (highlighted in green on the attached map): 9087732 bur oak, Prairie Harvest hackberry, Oahe hackberry, and 9094281 American cranberrybush. The 9087732 bur oak is a selection developed by the Plant Materials Center at Bridger, Montana. This selection, known as Ekalaka Germplasm bur oak, should be well-adapted to western North Dakota.

In June 2009, a map of the evaluation site was prepared as a handout for the expected visitors to Bottineau, which was celebrating its 125th anniversary.

On Sept. 8, 2009, Corey Walker, Soil Conservationist, helped evaluate 17 accessions of selected trees and shrubs. Measurements were taken of survival, vigor, height and width. One of the new entries planted was the Prairie Harvest hackberry, which was released by the PMC in 2009. This improved selection from Polk County, Minnesota, was selected for greater growth rate and cold hardiness. It was planted alongside seedlings of 'Oahe' hackberry which is an older variety originating from central South Dakota. The Prairie Harvest hackberry had better survival than the Oahe after one growing season. Another selection of hackberry (9057410) that is included in the Bottineau evaluation planting originates from the Denbigh area. This slower growing seed source has averaged less than a foot of growth per year. A growth rate of at least a foot per year is desired.

The total precipitation at Bottineau for 2009 was below normal, at 17.28 inches. The rainfall for the months of June-September were all below normal, which likely affected the growth rate, though the average monthly temperatures for those months was also below 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, 'McDermand' 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**
'McDermand' 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 and 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.

OFF-CENTER EVALUATIONS: TECHNICAL REPORT – 2009

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 expires January 20, 2010.

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 2009 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 2009.

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

many poplar 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 2009. 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.

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.

1982-2009: 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.

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, 90 accessions of 65 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. Some of the trees planted here, such as the hybrid poplars that were planted in 1990 grew very well initially, especially with years of above average rainfall in 1993-1995. Now they have reached a point where they need to be removed. The white poplar seems to be more 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:

Accession Number	Genus/Species Origin/Source	Plot Location
ND-1765 9005980	Siberian larch *Larix sibirica* USDA, FS, Shelterbelt Lab., Bottineau, ND	1B/03/1-10
ND-1873 9005648	Amur maple *Acer ginnala* Lincoln-Oakes Nursery, Bismarck, ND	3/09/1-5
SD-156 9005890	green ash *Fraxinus pennsylvanica* Deuel Co., Clear Lake, SD	4/01/1-5
ND-1879 9011850 PI-503531	honeylocust *Gleditsia triacanthos* ARS Field Station, Woodward, OK	4/04/1-5
SD-75 9005713	hackberry *Celtis occidentalis* Potter Co., SD	4/9/1-10
9069090	quaking aspen *Populus tremuloides* Lee Nursery, Fertile, MN	1A/5/6-10
9069168	Siberian larch *Larix sibirica* Altai Region, Russia	1A/09/6-10
9057413	Ponderosa pine *Pinus ponderosa* Glendive, MT NDFS	1B/05/1-5

Accession Number	Genus/Species Origin/Source	Plot Location
ND-3803	white poplar *Populus alba* USDA, NRCS, PMC, Bismarck, ND	1B/07/6-10
9063148	corktree *Phellodendron sachalinense* Clay Co., MN	1B/09/1-5
9076737	black cherry *Prunus serotina* 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			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 chockecherry	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	323957 chokeberry	9076686 roundleaf hawthorn		9082653 skunkbush sumac		ND-989 Japanese elm	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 05/09

Table No. DI-1: 2009 Weather Summary - Official Station - Dickinson, North Dakota					
	Mean Temperature (degrees Fahrenheit)		Precipitation (inches) Actual		Deviation from Normal
Month	**2009**	**Normal***	**2009**	**Normal***	**2009**
January	11.5	12.0	0.27	0.35	-0.08
February	14.8	18.9	1.33	0.37	0.96
March	22.9	28.7	2.99	0.67	2.32
April	38.1	41.3	0.81	1.63	-0.82
May	51.4	53.4	2.28	2.24	0.04
June	58.5	62.4	3.99	3.57	0.42
July	64.3	68.1	3.01	2.20	0.81
August	64.2	67.3	0.94	1.65	-0.71
September	62.5	55.4	1.42	1.62	-0.20
October	36.1	43.3	1.52	1.31	0.21
November	37.1	27.3	0.00	0.63	-0.63
December	9.1	16.2	0.57	0.37	0.20
Annual	**39.2**	**41.2**	**19.13**	**16.61**	**2.52**
*National Climate Data Center 1971-2000 Monthly Normals					

	2009
Last Frost (28 degrees)	16-May
First Frost (28 degrees)	9-Oct
Frost Free Period	145 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: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
IA/02/1-5	9082885	POTR5	aspen	11-May	04	04		5	5	100	4	0.8	1.9	browsed off regrowing
			Populus tremuloides			05			3	60	3	2.1	3.5	
			NDFS Nursery, Towner, ND			06			5	100	4	2.0	2.7	
						08			3	60	4	2.0	2.5	
1A/02/6-10	9082619	FRPE	green ash	16-May	02	02	CONT	5	5	100	5	0.5	0.8	3,5 browsed by rabbit
			Fraxinus pennsylvanica			03			3	60	4	0.5	1.3	
			Jordan, MT			04			5	100	3	0.9	2.4	
			Valley Nursery, Helena, MT			06			5	100	3	2.1	4.3	
						08			5	100	4	2.7	5.6	
IA/03/1-5	'Manitou'	POPUL	poplar	9-May	90	90	PLBR	5	5	100	2	1.7	3.0	
	9058874		*Populus*			91			5	100	4	2.5	4.1	
	14392		USDA, ARS, Mandan, ND			92			5	100	4	1.6	3.2	
			Lincoln-Oakes Nursery, Bismarck, ND			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
IA/03/6-10	'CanAm'	POPUL	poplar	9-May	90	90	PLBR	5	5	100	3	1.2	3.7	
	9058873		*Populus*			91			1	20	5	1.0	2.0	
	14390		USDA, ARS, Mandan, ND			92			5	100	4	1.6	3.2	
			Lincoln-Oakes Nursery, Bismarck, ND			94			5	100	3	5.9	11.0	
						96			5	100	4	10.8	16.7	
						99			5	100	4	9.7	30.1	
						05			4	80	4	14.4	29.3	
						09			0	0				
IA/04/1-5	9030611	POAL7	white poplar	15-May	92	92	CONT(P)	5	4	80	4	1.6	1.6	
	ND-3796		*Populus alba*			93			5	100	2	3.8	3.7	
			Turner Co., SD			94			4	80	3	6.3	5.9	
			USDA, NRCS, PMC, Bismarck, ND			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	

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IA/05/1-5	9082640	QUGA	Gambel oak	13-May	99	99	CONT	5	5	100	3	0.8	1.6	
			Quercus gambelii			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	93	PLBR	5	4	80	5	0.8	1.7	
			Populus tremuloides			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	QUMA	bur oak	6-May	09	09	PLBR	5	5	100	4	1.6	2.5	
			Quercus macrocarpa											
			USDA, NRCS, PMC, Bridger, MT											
IA/06/6-10	'Assiniboine'	POPUL	hybrid poplar	10-May	93	93	PLBR	5	5	100	4	0.5	1.8	
	9063147		*Populus*			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	93	PLBR	5	5	100	3	1.6	3.4	
			Populus deltoides			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	

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1A/07/6-10	9082739	OSVI	ironwood	8-May	08	08		5	1	20	8	0.5	1.3	
			Ostrya virginiana			09			1	20	4	0.8	2.0	
			Sertoma Park, Bismarck, ND											
			USDA, NRCS, PMC, Bismarck, ND											
IA/08/1-5	'Hunter Germplasm'	PIPOS	ponderosa pine	17-May	05	05		5	5	100	4	0.9	1.3	
			Pinus ponderosa var. *scopulorum*			06			5	100	3	1.1	1.8	
	9081843		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'	JUSC2	Rocky Mountain juniper	17-May	05	05		5	5	100	5	0.7	1.0	one mowed off
	9078631		*Juniperus scopulorum*			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	98	CONT	5	4	80	4	0.8	1.2	
			Pinus sylvestris var. *mongolica*			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	LASI	Siberian larch	4-May	98	98	CONT	5	4	80	4	0.6	1.3	
			Larix sibirica			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	04		5	1	20	3	0.8	1.3	
			Pinus mugo			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	

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IB/01/1-10	ND-1729	LASI*	Siberian larch	16-May	78	78	PLBR	10	9	90	3	0.7	2.0	
	9005979		*Larix sibirica*			79			10	100		0.7	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
						84			6	60	4	1.3	3.0	damage
						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	LASI*	Siberian larch	17-May	78	78	PLBR	10	10	100	3	0.6	2.2	
	Pallet No.		*Larix sibirica*			79			10	100		0.8	1.6	
	2392		Denbigh Exp. Forest			80			10	100	4	1.4	2.0	
	9005976		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
						84			8	80	2	2.6	5.6	damage
						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	LASI*	Siberian larch	17-May	78	78	PLBR	10	10	100	3	0.6	1.4	
	9005980		*Larix sibirica*			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
						84			10	100	4	3.6	6.1	accession of larch
						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	PIPO	ponderosa pine	16-May	78	78	CONT	5	5	100	1	0.5	1.7	
	9006043		*Pinus ponderosa*			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	PIAR	bristle cone pine	16-May	78	78	CONT	5	5	100	3	0.5	0.6	
	9006036		*Pinus aristata*			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	
			Pinus ponderosa			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	PINUS	Siberian pine	14-May	03	03		5	5	100				
			Pinus sibirica			04			5	100	3	0.6	0.8	
			Altai			05			5	100	4	1.0	0.9	
			USDA, NRCS, PMC, Bismarck, ND			07			5	100	3	0.8	1.0	
						09			2	40	4	1.5	1.1	
IB/06/1-5	9069172	PISY	Scots pine	6-May	97	97	CONT	5	5	100	2	0.5	1.2	
			Pinus sylvestris			98			4	80	3	1.2	1.7	
			Altai region, Russia			99			5	100	1	1.3	2.6	
			USDA, NRCS, PMC, Bismarck, ND			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	PICO	lodgepole pine	6-May	09	09			5	100	4	0.5	1.0	
			Pinus contorta var. *latifolia*											
IB/07/6-10	ND-3803	POAL7	white poplar	24-May	94	94	CONT	5	5	100	3	2.0	3.1	
	9030612		*Populus alba*			95			4	80	2	6.2	6.5	
			USDA, PMC, Bismarck, ND			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	PRPE	pin cherry	6-May	09	09		5	5	100	3	0.6	1.9	
			Prunus pensylvanica											
IB/08/6-10	9082687		black currant	9-May	07	07		5	0	0				
			Ribes americanum			08			2	40	6	0.4	1.8	
			Big Sioux Nursery, Watertown, SD			09			4	80	3	2.0	2.1	

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IB/09/1-5	9063148	PHSA	corktree	4-May	95	95	CONT	5	5	100	4	0.7	1.3	
			Phellodendron sachalinense			96			4	80	3	1.7	2.2	
			Clay Co., MN			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	
						09			3	60	3	14.2	13.3	
IB/09/6-10	ND-21	VILE	nannyberry	7-May	86	86	PLBR	5	5	100	3	0.5	1.5	
	9034900		*Viburnum lentago*			87			5	100	3	0.7	1.9	
			USDA, ARS, Mandan, ND			88			5	100	3	1.5	2.7	
			USDA, NRCS, PMC, Bismarck, ND			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	TICO	littleleaf linden	10-May	93	93	CONT(P)	5	5	100	5	0.7	1.3	weedy
			Tilia cordata			94			5	100	4	0.6	1.2	
			Lee Nursery, Fertile, MN			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	ULJA80	Japanese elm	15-May	92	92	CONT(P)	5	3	60	4	1.7	1.7	
			Ulmus japonica			94			3	60	3	4.2	4.5	
			Manchuria			96			5	100	4	5.9	6.3	5 is sucker
			PFRA, Indianhead, Saskatchewan, Canada			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	LOTAS*	red tatarian honeysuckle	17-May	78	78	PLBR	10	9	90	1	1.5	1.6	
	9005996		*Lonicera tatarica sibirica*			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	LOTAS*	red tatarian honeysuckle	17-May	78	78	PLBR	10	10	100	1	1.6	1.7	
	9005994		*Lonicera tatarica sibirica*			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	03		5						weedy, poor survival
			Rhus glabra			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	
ll/02/6-10	9008183	PRVI	common chokecherry	17-May	05	05		5	4	100	4	1.0	2.3	
			Prunus virginiana			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		*Lonicera*			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	LOXYM*	honeysuckle	2-May	79	79	PLBR	5	5	100		1.2	1.3	
	9019978		*Lonicera xylosteum mollis*			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	COIN	cotoneaster	9-May	90	90	CONT	5						
	9005728		*Cotoneaster integerrimus*			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	
			Euonymus bungeanus			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'	PRTE80	Russian almond	8-May	80	80	PLBR	10	10	100	5	0.8	2.2	
	ND-283		*Prunus tenella*			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	81	CONT	10	10	100		0.7	0.6	
	9005993		*Lonicera maackii*			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	
II/05/11-20	'Centennial'	COIN	cotoneaster	8-May	85	85	PLBR	10						no data
	ND-177		*Cotoneaster integerrimus*			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	16-May	02	02	CONT	5	5	100	5	1.0	1.4	
			Rosa rugosa			03			3	60	3	0.8	1.0	
			Lincoln-Oakes Nursery, Bismarck, ND			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	13-May	99	99	CONT	5						
			Sambucus nigra ssp. *caerulea*			00			5	100	4	1.5	2.9	
			Lincoln-Oakes Nursery, Bismarck, ND			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	6-May	97	97	PLBR	5	4	80	3	1.1	1.7	
			Prunus serotina			98			5	100	4	2.8	3.0	
			Apple Valley FEP, ND			00			5	100	3	6.6	7.9	
			Lincoln-Oakes Nursery, Bismarck, ND			03			5	100	2	12.4	12.5	
						06			5	100	2	16.0	15.0	
II/07/6-10	'McKenzie'	PHME13	black chokeberry	23-May	00	00	PLBR	5	5	100	3	0.9	1.7	
	323957		*Photinia melanocarpa*			01			5	100	4	1.8	1.7	
			Lincoln-Oakes Nursery, Bismarck, ND			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	10-May	93	93	PLBR	5	5	100	4	1.2	2.0	
			Prunus			94			5	100	4	1.7	2.6	
			Bottineau FEP, ND			95			4	80	4	2.6	3.0	
			Lincoln-Oakes Nursery, Bismarck, ND			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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II/08/6-10	9082713	PRPEP2	Siberian peach	16-May	02	02	PLBR	5	5	100	2	1.6	2.7	
			Prunus persica var. *persica*			03			5	100	4	4.1	4.0	
			Lincoln-Oakes Nursery, Bismarck, ND			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'	CRAN6	Arnold hawthorn	9-May	84	84	CONT	10	10	100	4	0.7	0.3	
	ND-20		*Crataegus X anomala*			86			10	100	4	1.7	2.7	
	9005731		USDA, NRCS, PMC, Bismarck, ND			88			10	100	3	3.8	4.8	
	PI-503530					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	PRPA5	mayday	8-May	85	85	PLBR	10						no data
	9006073		*Prunus padus*			86			10	100	3	1.5	2.8	
	PI-536048		Brookings Co., SD			87			10	100	3	2.3	4.7	
			USDA, NRCS, PMC, Bismarck, ND			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	JUNIP	common juniper	4-May	06	06	CONT	5	5	100	4	1.6	1.0	
	9019593		*Juniperus communis*			07			4	80	5	0.8	0.7	
						08			3	60	3	1.1	0.9	
II/10/6-10	9057438	HAHA8	Siberian salt tree	11-May	94	94	CONT	5	1	20	3	0.3	1.1	
			Halimodendron halidendron			95			4	80	4	0.6	1.3	
			PFRA, Indianhead, Saskatchewan, Canada			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	
			Celastrus scandens			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		*Malus mandshurica*			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	MABA*	flowering crabapple	17-May	78	78	PLBR	5	5	100	2	1.6	2.2	
	Splendor'		*Malus X*			79			5	100		2.5	3.8	
	9006004		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	MABA*	Siberian crabapple	17-May	78	78	PLBR	5	4	80	2	1.9	2.2	
	9006001		*Malus baccata*			79			5	100		2.8	3.1	
			Lincoln-Oakes Nursery,			80			5	100	3	4.1	4.1	
			Bismarck, ND			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	'McDermand'	PYUS2	Ussurian pear	17-May	78	78	PLBR	5	5	100	6	0.9	2.5	
	ND-14		*Pyrus ussuriensis*			79			5	100		1.8	3.6	
	9006095		Harbin, Manchuria/Res. Sta.			80			5	100	1	3.0	4.6	
	PI-478004		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'	LOKO2	honeysuckle	9-May	90	90	PLBR	5	5	100	5	1.0	1.1	
	9057424		*Lonicera korolkowii*			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	
			Lonicera tatarica			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 Germplasm	AMFR	false indigo	6-May	87	87	PLBR	5	4	80		1.3	1.7	
	9008041		*Amorpha fruticosa*			88			5	100	5	2.8	2.1	
			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		*Lonicera tatarica*			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		*Rhus aromatica*			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	90	PLBR	10	9	90	3	0.6	1.6	
	PI-478003		*Prunus fruticosa*			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								orignal row gone, suckers on each side
III/04/16-20	'Legacy'	SYVI3	late lilac	11-May	88	88	PLBR	5	2	40	6	1.0	1.7	
	ND-83		*Syringa villosa*			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	90	PLBR	10	3	30	3	0.7	2.2	
	ND-10		*Shepherdia argentea*			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	92	PLBR	5	5	100	5	0.5	1.1	
	PI-514275		*Malus* 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	ACTA80	tatarian maple	13-May	96	96	PLBR	5	5	100	3	1.0	0.9	
			Acer tataricum			97			5	100	5	2.2	1.7	
			USDA, ARS, Mandan, ND			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	
lll/06/6-10	9091969	CAFR80	Russian peashrub	17-May	05	05		5	5	100	4	0.8	3.4	
			Caragana frutex			06			5	100	6	0.6	2.6	
			Big Sioux Nursery, Watertown, SD			07			5	100	5	0.9	2.6	
						09			5	100	4	0.9	2.9	
III/07/1-5	9076686	CRCH	roundleaf hawthorn	11-May	04	04		5	2	40	6	0.3	0.4	#5 browsed
			Crataegus chrysocarpa			05			1	20	8	0.2	0.2	
			Lincoln-Oakes Nursery, Bismarck, ND			06			4	80	6	0.2	0.9	
						08			1	20		0.3	1.0	rabbits ate all branches
						09			0	0				plants all dead
III/07/6-10	9082653	RHTR	skunkbush sumac	14-May	03	03		5	5	100				
			Rhus trilobata			04			5	100	3	1.4	1.4	
			Harding Co., SD			05			4	80	4	2.0	1.5	
			USDA, NRCS, PMC, Bismarck, ND			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'	PRUNU	plum	8-May	85	85	PLBR	5						no data
	ND-1134		*Prunus*			86			5	100	8	0.5	1.3	
	9047203		Miller, SD			87			3	60	4	1.9	3.0	
			USDA, NRCS, PMC, Bismarck, ND			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	ACGI	amur maple	2-May	79	79	PLBR	5	5	100		1.0	1.5	
	9005645		*Acer ginnala*			80			0					
	PI-477992		Res. Sta., Morden, MB, Canada			81			4	80		1.3	1.9	
						83			4	80	3	6.0	6.0	
						84			4	80	4	9.9	7.5	
						88			4	80	4	13.0	10.8	
						93			3	60	5	13.1	12.0	
						98			3	60	3	18.4	17.4	
						03			3	60	3	24.5	16.4	
						08			3	60	5	32.0	16.2	
III/09/1-5	ND-1873	ACGI	amur maple	2-May	79	79	PLBR	5	5	100		1.6	2.2	
	9005648		*Acer ginnala*			80			5	100	3	2.8	3.0	
			Lincoln-Oakes Nursery, Bismarck, ND			81			5	100		4.2	4.3	
						83			5	100	2	7.2	7.4	good seed production
						84			5	100	3	10.0	8.8	
						88			5	100	4	13.2	11.7	
						93			5	100	4	10.0	9.9	
						98			5	100	3	16.1	13.4	
						03			5	100	3	19.9	14.6	
						08			5	100	4	18.0	14.5	
III/09/6-10	ND-686	SYREP	pekin lilac	2-May	79	79	PLBR	5	5	100		0.7	2.3	
	9006225		*Syringa reticulata* ssp. *pekinensis*			80			2	40	7	1.5	2.7	
	PI-478008		ND Game & Fish Dept.			81			2	40		1.5	2.8	
						83			3	60	5	3.3	3.8	
						84			5	100	5	3.1	2.9	
						88			3	60	4	8.3	8.3	
						93			3	60	4	10.1	9.9	
						98			3	60	3	15.5	14.2	
						03			3	60	3	18.5	16.5	
						08			3	60	3	21.0	16.5	

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PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
III/10/1-5	9069129	PRMA	Amur chokecherry	11-May	94	94	PLBR	5	5	100	4	0.7	2.2	
			Prunus maackii			96			5	100	2	4.1	6.4	
			Big Sioux Nursery, Watertown, SD			98			5	100	3	7.7	10.7	
						00			5	100	4	9.1	12.7	
						03			5	100	4	11.2	12.5	
						08			5	100	5	10.0	12.8	
IV/01/1-5	SD-156	FRPE	green ash	17-May	78	78	PLBR	5	5	100	1	0.5	2.6	
	9005890		*Fraxinus pennsylvanica*			79			5	100		1.3	3.6	
			Deuel Co., SD			80			5	100	2	2.2	4.4	
						82			5	100	3	5.6	7.6	
						83			5	100	3	7.3	9.7	slight leaf scorch
						84			5	100	3	8.0	10.8	
						87			5	100	3	8.6	14.2	snow damage on 1
						92			5	100	4	8.9	15.8	
						97			5	100	4	13.5	18.3	
						02			5	100	6	17.0	25.5	
						07			5	100	5	18.8	25.8	
IV/01/6-10	ND-1734	FRPE	green ash	17-May	78	78	PLBR	5	5	100	2	0.4	2.1	
	9005891		*Fraxinus pennsylvanica*			79			5	100		1.0	3.1	
			Lincoln-Oakes Nursery, Bismarck, ND			80			5	100	4	1.9	3.7	
						82			5	100	4	4.7	7.3	
						83			5	100	4	5.7	8.8	competition from
						84			5	100	4	6.4	10.3	shelterbelt at east end
						87			5	100	4	7.1	13.8	
						92			5	100	5	8.3	14.0	
						97			5	100	4	12.8	20.3	
						07			5	100	5	15.0	24.8	

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IV/02/1-5	'Cardan'	FRPE	green ash	17-May	78	78	PLBR	5	5	100	2	0.3	2.3	
	MDN-12002		*Fraxinus pennsylvanica*			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	78	PLBR	5	5	100	1	0.4	2.5	
	9005893		*Fraxinus pennsylvanica*			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	78	PLBR	5	5	100	1	0.1	0.9	
	9005887		*Fraxinus nigra*			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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IV/03/6-10	ND-1432	AEGL	Ohio buckeye	17-May	78	78	PLBR	5	3	60	8	0.0	0.2	
	9005658		*Aesculus glabra*			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	GLSI	honeylocust	8-May	80	80	PLBR-	5	1	20	9	0.3	0.5	
	9011850		*Gleditsia triacanthos*			81	CONT		2	40		0.1	0.8	
	PI-503531		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	
			Fraxinus nigra			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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PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
IV/06/1-5	9063115	FRPE	green ash	11-May	94	94	CONT	5	5	100	3	0.7	1.7	
			Fraxinus pennsylvanica			95			5	100	3	1.5	3.3	
			Itasca State Park, MN			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	13-May	96	96	PLBR	5	4	80	3	2.2	2.3	
			Elaeagnus angustifolia			97			4	80	3	3.3	3.4	
			USDA, ARS, Mandan, ND			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	
IV/07/1-5	9019624	ULJA80	Japanese elm	11-May	94	94	CONT	5	4	80	4	1.0	1.4	
	ND-989		*Ulmus japonica*			95			5	100	3	2.8	3.6	
			USDA ARS, Mandan, ND			96			4	80	3	5.6	6.2	
						98			4	80	4	9.8	9.7	
						00			4	80	2	8.3	11.8	
						03			3	60	5	11.7	13.3	
						08			0	0				
IV/07/6-10	9069166	ELAN	Russian olive	13-May	96	96	CONT(S)	5	1	20	5	0.5	0.7	1-4 destroyed by cultivation
			Elaeagnus angustifolia			97			4	80	3	1.0	1.3	
			USDA, ARS, Mandan, ND			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	

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PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
IV/08/1-10	'Oahe'	CEOC	hackberry	8-May	80	80	PLBR	10	10	100		0.5	2.0	
	MDN-12003		*Celtis occidentalis*			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	81	PLBR	10	10	100		0.1	1.2	
	9005713		*Celtis occidentalis*			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	
IV/10/6-10	9057410	CEOC	hackberry	11-May	88	88	CONT	5	2	40	8	0.2	0.2	
			Celtis occidentalis			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	

Below is the 2009 annual progress report, a stand-alone publication, for this study.

2009 Report
Off-Center Evaluation Planting of Woody Plant Materials Dickinson, North Dakota

Mike Knudson, Forester
Rachel Bergsagel, Biological Science Technician
USDA-NRCS, Plant Materials Center, Bismarck, North Dakota

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 six 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.

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. A separate report containing all data can be found at the NRCS Area Office in Dickinson, or at the Bismarck PMC. Contact Mike Knudson 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 6, 2009, three new accessions of trees and shrubs were planted, including 9087732 bur oak, 9092231 lodgepole pine, and 9091967 pin cherry (see plots highlighted in green on the attached map). The bur oak selection was received from the Plant Materials Center at Bridger, Montana. It is known as Ekalaka Germplasm bur oak and should be adapted to western North Dakota. The lodgepole pine seedlings originated from a seed collection in Colorado. This is a new species for North Dakota. 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. 11, 2009, Mike Knudson and Dennis Devault, PMC WAE, evaluated 24 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 is used to treat stumps of live seedlings cut down. This helps prevent sprouting.

The total precipitation in Dickinson for 2009 was about 2.5 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.

OFF-CENTER EVALUATIONS: TECHNICAL REPORT – 2009

Study 38I318K University of Minnesota, West Central Research and Outreach Center, Morris, 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 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 University of Minnesota, West Central Research and Outreach Center, Morris, Minnesota. The cooperative agreement expired in July 28, 2008. This study was terminated following the 2009 growing season.

Location: Morris, Minnesota. Legal description: Sec. 31, T. 125 N., R. 41 W., Stevens County, Minnesota.

Major Land Resource Area: The site is located in Major Land Resource Area 102A, Rolling Till Prairie. This is nearly level to rolling glacial plain mantled by loess except in the north. Slopes are long, smooth, and gentle except the hilly to steep slopes bordering some of the larger stream valleys. Relief is mainly in a few feet to a few tens of feet. Elevation is 1,000 to 2,000 feet.

Soils: The soils at this site are Barnes-Buse loams (BbB2). These series consist of deep, well-drained soils formed in loamy calcareous glacial till under prairie grasses on moraines and uplands. For Barnes, the surface layer is black loam 7 inches thick. The subsoil is dark brown and olive-brown loam 12 inches thick and the substratum is olive-brown loam. For Buse, the surface is very dark gray loam 7 inches thick. The underlying material is light brownish-gray and light yellowish-brown loam. These soils are in conservation tree/shrub group 3.

The Barnes soil makes up 60 to 70 percent of the mapped area. Runoff is medium, erosion hazard moderate, and fertility medium. Slopes are 2 to 6 percent.

The Barnes soils in this group 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 Buse soils in this group are deep, well-drained, and loamy. Available water capacity is high, but excessive runoff restricts water intake and the amount of moisture available to trees and shrubs. These soils are not suited to field windbreaks, but are suited to wildlife, recreation, and beautification plantings. Species and planting sites should be carefully selected.

Climate: For MLRA 102A, the average annual precipitation is 20 to 30 inches; increasing from north to south and from west to east. About three-fourths falls from midspring to early autumn. The sparse winter precipitation is snow. The average annual temperature is 40 to 50 degrees F, increasing from north to south. The average freeze-free period is 140 to 160 days. The plant hardiness zone is 4a with an average

annual minimum temperature of -30 to -20 degrees F. Climatic data recorded at Morris, Minnesota, for 2009 is shown in Table MO-1.

Methods and Materials

Assembly: Refer to Table MO-2 for a list of woody species planted from 1978 through 2009.

Planting Plan: The plots are not randomized or replicated but organized systematically for evaluation and demonstration purposes. The site is divided into 4 blocks. Block 1 is planted to shrubs, Block 2 medium trees, Block 3 tall trees, and Block 4 conifers (Refer to Figure MO-1 for the plot map). Each block is arranged into single row, non-replicated plots. Each plot contains from 1 to 20 plants. Spacing is 20 feet between rows and 5 feet within row for shrubs; 10 feet within row for medium-tall 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 is prepared annually by disking.

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

Planting Date: Refer to Table MO-2 for planting dates of woody species planted from 1978 through 2009. Replacements are planted the year after establishment if available.

Fertilization: No fertilizer has been applied to planting area.

Weed Control: Herbicides and mechanical weed control measures were applied to control weeds between and within rows and in fallow areas. Hand hoeing was done as needed to control weeds in rows.

Biological Control: No insecticides have been applied. In some years, an animal repellent, Arasan 50, has been applied to discourage rodents from damaging tree trunks and lower limbs.

Irrigation: Each year, newly planted materials were hand watered from a portable tank, if needed. No water was added following year of establishment.

Crop Residue Management: A mixture of 50 percent Bad River blue grama and 50 percent Pierre sideoats grama was broadcast seeded between the tree rows on May 7, 2002.

Silvicultural Practices: Dead trees and broken branches were cut and removed annually for sanitation. All the Russian olive accessions have been removed. All new plants are mulched with wood chips. Major renovation occurred in 1997 when a backhoe was used to remove dead and poor performing entries.

Evaluations and Measurements: Records of planting date, survival, vigor, canopy width, and plant height have been maintained since 1978. Cold hardiness, insect and disease resistance, and animal damage were considered. Plant performance data is recorded during the growing season for three years. After the third year, data is gathered according to a specific schedule. Select data appears in this report. A report summarizing the first 25 years of evaluation was published in 2003. Annual summary reports have been prepared since 2006 and can be requested from the PMC.

Results

Plant Performance: One hundred twenty-nine accessions of 91 species are currently under evaluation. In 1995, evaluation of the conifers in Block 4 was discontinued due to poor adaptation to the heavy soils, but trees are still in place. Rainfall and humidity are higher than evaluation sites in the Dakotas, which increases the disease potential for species adapted to semiarid regions. Mean data for individual accessions

of trees and shrubs is shown in Table MO-2. The following accessions exhibit potential for further evaluation and use.

Accession Number	Genus/Species Origin/Source	Plot Location
ND-170 9005728	cotoneaster *Cotoneaster integerrimus* USDA, NRCS, PMC, Bismarck, ND	01/07/11-20
ND-21 PI-560908	nannyberry *Viburnum lentago* USDA, ARS, Mandan, ND	02/07/1-10
ND-647 9005887	black ash *Fraxinus nigra* Res. Sta., Morden, MB, Canada	03/05/1-10
9057409	American hazel *Corylus americana* Turtle Mountains, Bottineau Co., ND NDFS	1/19/1-10
9076722	European white birch *Betula pendula* Russia USDA, ARS, Mandan, ND	II/16/1-5
ND-2103 PI-399414	European cranberrybush *Viburnum opulus* P.I. Station, Ames, IA/Yugoslavia NDSU Experiment Station, Dickinson, ND	I/17/11-20
9082642	wayfaring tree *Viburnum lantana* Lincoln-Oakes Nursery, Bismarck, ND	I/03/11-20
9076718	Scots pine *Pinus sylvestris* var. *mongolica* USDA, NRCS, PMC, Bismarck, ND	II/14/1-5
9076719	Scots pine *Pinus sylvestris* var. *mongolica* USDA, NRCS, PMC, Bismarck, ND	II14/6-10
9082687	black currant *Ribes americanum* Big Sioux Nursery, Watertown, SD	I/9/11-15
9082631	Japanese birch *Betula platyphylla* Lawyer Nursery, Plains, MT	II/12/1-5

Accession Number	Genus/Species Origin/Source	Plot Location
SD-156 9005890	green ash *Fraxinus pennsylvanica* Deuel Co., Clear Lake, SD	III/01/1-10
SD-75 9005713	hackberry *Celtis occidentalis* Potter Co., SD	III/16/1-5
SD-211 9005714	hackberry *Celtis occidentalis* Sanborn Co., SD	III/16/6-10

Figure MO-1. Morris Woody Off Center Evaluation Planting – Plot Layout

			← N	
BLOCK II MEDIUM TREES		**BLOCK I SHRUBS**		**Row**
open	open	<----------	Centennial cotoneaster	1
(leave open) ---------->		9063143 t. honeysuckle	Arnolds Red honeysuckle	2
<----------	ND-1731 S. crabapple	9082642 wayfaring tree	9082632 Mongolian peashrub	3
<----------	McDermand pear	<----------	Scarlet Mongolian cherry	4
<----------	Streamco willow	peashrub|9008183 chokecherry	9069128 r.t. honeysuckle	5
open	open	<----------	Legacy late lilac	6
<----------	ND-21 nannyberry	rugosa rose | redleaf rose	ND-170 cotoneaster	7
Libbon willow | Staghorn sumac	Meyer's spruce	leadplant | 9091971 chokeberry	Euonymus |ironwood	8
9069129 amur chokecherry	nannyberry | olive hybrid	black currant | bittersweet	ND-3902 sandbar willow	9
<----------	ND-2102 apricot	<----------	Regal Russian almond	10
'Cathedral' elm	Korean Mtn. ash	Freedom honeysuckle|Rosetree (	ND-11 amur honeysuckle	11
9091974 red oak	9082631 Japanese birch	gray dogwood | Caragana frutex	Indigo silky dogwood	12
9091973 red oak	9082635 black locust	M.gooseberry | prairie rose	(leave open)	13
9076719 Scotch pine	9076718 Scotch pine	smooth sumac | gray dogwood	ninebark | MO plum	14
9069163 Dahurian larch	9076737 black cherry	Am. Hazelnut | r.l. hawthorn	Am. h.bush cranberry|pin cherry	15
9069121 mayday	9076722 European white birch	ND-3744 Korean barberry	chokeberry | Konza sumac	16
9076725 smoothbark elm	9069170 English oak	ND-2103 highbush cranberry	Meadowlark forsythia	17
9082610 Siberian larch	9069168 Siberian larch	9091976 arrowwood | apricot	ND-2507 pigmy caragana	18
9092051 catalpa	9063126 Japanese elm	Hedgeking honeysuckle	9057409 American hazel	19
9092052 swamp white oak	9082666 black birch	SOD		20
<----------	Flame amur maple			21
<----------	ND-1752 amur maple			22
<----------	ND-629 amur maple			23
<----------	ND-1873 amur maple			24
ND-686 Pekin lilac	open			25
<----------	Homestead Arnold hawthorn			26
<----------	open			27
<----------roadway---------->		<----------roadway---------->		
			(revised 6/09)	

Figure MO-1(continued). Morris Off Center Evaluation Planting – Plot Layout

	← N	
BLOCK III TALL TREES		**Row**
<----------	SD-156 green ash	1
ND-1734 green ash	ND-1753 green ash	2
<----------	Cardan green ash	3
<----------	ND-1759 green ash	4
<----------	ND-647 black ash	5
9063120 Ohio buckeye	ND-1432 Ohio buckeye	6
<----------	9057410 hackberry	7
P.H. hackberry|Oahe hackberry	9063148 corktree	8
9082674 sugar maple| open	9082668 European ash | open	9
(leave open)	Clone C Austree	10
14272 poplar	14271 poplar	11
14274 poplar	14273 poplar	12
9082667 gray birch | open	Canam hybrid poplar	13
9076746 Ohio buckeye	9082892 white poplar | open	14
<----------	Oahe hackberry	15
SD-211 hackberry	SD-75 hackberry	16
9082650 Soongarica poplar	9082675 Manchurian ash	17
9063098 black walnut	9076723 Siberian elm	18
9076724 Russian olive	open	19
9069166 Russian olive	open	20
ND-428 black walnut	9054820 Siberian elm	21

Table No. MO-1: 2009 Weather Summary - Official Station - Morris, Minnesota					
	Mean Temperature (degrees Fahrenheit)		Precipitation (inches)		
			Actual		Deviation from Normal
Month	**2009**	**Normal***	**2009**	**Normal***	**2009**
January	0.9	8.4	0.51	0.85	-0.34
February	12.2	15.4	0.95	0.69	0.26
March	25.2	28.1	2.84	1.52	1.32
April	41.4	44.1	0.88	2.01	-1.13
May	55.5	57.9	0.48	2.84	-2.36
June	64.5	66.9	2.12	3.97	-1.85
July	66.0	71.1	1.02	3.95	-2.93
August	65.1	69.0	3.78	3.30	0.48
September	63.1	59.0	2.50	2.16	0.34
October	39.5	46.1	6.77	2.30	4.47
November	37.9	29.0	0.33	1.22	-0.89
December	11.9	14.6	1.32	0.58	0.74
Annual	**40.3**	**42.5**	**23.50**	**25.39**	**-1.89**
*National Climate Data Center 1971-2000 Monthly Normals					
		2009			
Last Frost (28 degrees)		10-Apr			
First Frost (28 degrees)		9-Oct			
Frost Free Period		181 days			

Key to Table MO-2. 38I318K Field Evaluation of Woody Plant Materials – Morris, 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 MO-2.
Project No.: 38I318K University of Minnesota, West Central Research and Outreach Center, Morris, Minnesota
Year of Record: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
I/01/1-20	'Centennial'	COIN*	cotoneaster	10-May	78	78	PLBR	20	12	60	3	1.4	1.5	
	ND-177		*Cotoneaster integerrimus*			79			17	85	4	3.5	3.2	
	9005729		USDA, ARS, Cheyenne, WY			80			17	85		5.2	3.4	
	PI-113095		USDA, NRCS, PMC, Bismarck, ND			82			17	85		9.7	5.9	
						83			17	85		11.1	6.6	
						84			17	85	2	12.6	7.4	
						87			17	85	2	14.6	9.7	
						92			17	85	1	16.5	9.4	
						97			17	85	1	21.3	12.0	
						02				85		24.0	11.0	
						07								severe contamination, need removal
I/02/1-10	'Arnolds Red'	LOTA	red tatarian honeysuckle	27-Apr	93	93	PLBR	10	10	100	4	0.9	1.2	
	9069080		*Lonicera tatarica sibirica*			94			8	80	5	1.8	2.3	
			Lee Nursery, Fertile, MN			95			10	100	4	2.3	3.5	
						97			10	100	2	5.1	5.9	
						99			10	100	4	5.6	7.0	
						02			10	100	3	6.8	8.4	
						07			10	100	3	10.0	12.5	
I/02/11-20	9063143	LOTA	red tatarian honeysuckle	27-Apr	93	93	PLBR	10	9	90	5	0.9	1.5	
			Lonicera tatarica sibirica			94			9	90	4	1.7	2.4	
			Iowa			95			9	90	5	2.9	3.6	
			Lincoln-Oakes Nursery, Bismarck, ND			97			10	100	2	5.2	5.8	
						99			9	90	3	6.1	6.9	
						02			9	90	3		8.7	
						07			9	90	3	11.0	10.6	
1/03/1-10	9082632	CAIN	Mongolian peashrub	29-Apr	99	99	PLBR	10	9	90	5	1.0	1.3	
			Caragana intermedia			00			9	90	4	2.5	1.8	
			Lawyer Nursery, Plains, MT			01			9	90	5.1	3.8	3.1	
						03			7	70	4	4.6	3.8	
						05			7	70	4	5.1	5.0	
						08			7	70	4	7.1	4.8	

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Year of Record: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
1/03/11-20	9082642	VILE	wayfaring tree	29-Apr	99	99	PLBR	10	10	100	4	0.7	1.2	
			Viburnum lantana			00			10	100	2	2.0	2.4	
			Lincoln-Oakes Nursery, Bismarck, ND			01			10	100	3	3.3	3.6	
						03			10	100	4	4.0	4.9	
						05			10	100	4	5.7	4.5	red color 4, unusual fruit 6,
						08			6	60	5	4.0	5.2	some dead on 8, pruned 10
I/04/1-20	'Scarlet'	PRFR2	Mongolian cherry	10-May	78	78	PLBR	20	20	100	3	0.7	1.3	
	ND-3		*Prunus fruticosa*			79			19	95	4	1.9	2.3	
	9006072		Res. Sta. Morden, Manitoba, Canada			80			20	100		3.0	3.2	
	PI-478003		USDA, NRCS, PMC, Bismarck, ND			82			20	100	4	4.7	4.6	
						83			20	100		5.6	4.9	
						84			20	100	3	6.4	5.6	
						87			19	95	1	7.6	6.6	
						92			20	100	1	12.3	7.9	
						97			20	100	2	17.1	10.5	stand weakening
						02			18	90		18.0		
						07								severe contamination, needs removal
I/05/1-10	9069128	LOTA	red tatarian honeysuckle	26-Apr	95	95	PLBR	10	10	100	6	1.1	2.2	
			Lonicera tatarica			96			10	100	3	3.1	3.5	blight on 2, mites on 4
			Big Sioux Nursery, Watertown, SD			97			10	100	1	5.3	6.8	very uniform
						99			10	100	2	6.3	9.3	
						01			10	100	3	8.3	1.2	
						04			10	100	3	10.3	14.8	
						05			10	100	4	12.0	14.0	
I/5/6-10	9008183	PRVI	common chokecherry	11-May	05	05		5	5	100	5	0.5	1.5	
			Prunus virginiana			06			5	100	6	0.7	1.6	
			Lincoln-Oakes Nursery, Bismarck, ND			07			5	100	4	0.5	1.3	3 browsed
						09			5	100	6	0.5	1.3	

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PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
1/05/15-20	9082663	CAMI	littleleaf peashrub	2-May	00	00		5	5	100	4	1.3	2.7	
			Caragana microphylla			01			5	100	4	2.0	4.0	
			Lawyer Nursery, Plains, MT			02			5	100	4	3.4	4.6	
						05			5	100		4.9	5.7	
						06			5	100	4	5.9	5.5	
						09			5	100	3	12.1	6.6	
I/06/1-20	'Legacy'	SYVI	late lilac	4-May	88	88	PLBR	20	12	60	4	0.5	1.4	
	ND-83		*Syringa villosa*			89			20	100	3	0.9	1.7	
	9006228		Res. Sta., Morden, Manitoba, Canada			90			18	90	4	1.8	2.5	
	PI-540443		Lincoln-Oakes Nursery, Bismarck, ND			92			20	100	3	3.8	4.0	seed production in all plants
						94			20	100	3	6.3	6.3	
						97			20	100	2	12.1	8.6	snow damage on 9-12,14
						02			19	95		17.3	11.0	variation in height
						07			20	100	3	18.0	12.0	
I/07/1-10	ND-170	COIN80	cotoneaster	1-May	90	90	CONT	10	9	90	3	1.5	1.9	
	9005728		*Cotoneaster integerrimus*			91			10	100	3	2.7	2.4	
			USDA, NRCS, PMC, Bismarck, ND			92			10	100	3	4.6	3.0	fruit production on all
						94			10	100	2	7.2	4.1	
						96			10	100	4	8.7	4.8	
						99			9	90	5	8.5	4.5	fireblight on all, contamination
						04			6	60	6	7.0	7.0	serious contam.; half dead, fire blight
I/07/11-15	9057406	RORU	rugosa rose		01	01	PLBR	5	5	100	4	1.7	1.7	
			Rosa rugosa			02			5	100	4	2.5	1.9	
			Lincoln-Oakes Nursery, Bismarck, ND			03			5	100	4	3.4	1.8	
						05			3	60	5	3.8	3.0	chlorosis, some dead
						07			2	40	4	4.6	2.9	
I/07/16-20	9082685	RORU2	redleaf rose		01	01	PLBR	5	5	100	3	1.6	1.4	
			Rosa rubrifolia			02			5	100	1	2.8	2.5	
			Lincoln-Oakes Nursery, Bismarck, ND			03			5	100	6	3.5	3.3	
						05			5	100	5	3.4	3.1	sparse leaves
						07			5	100	6	3.2	3.6	

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1/08/1-5	9082739	OSVI	ironwood	May	07	07		5	5	100	7	0.3	0.7	browsed
			Ostrya virginiana			08			4	80	6	0.6	0.6	browsed
			Sertoma Park, Bismarck, ND											
			USDA, NRCS, PMC, Bismarck, ND											
I/8/6-10	9082711	EUBU6	winterberry euonymus	7-May	02	02	PLBR	5	5	100	7	0.5	0.5	mowed
			Euonymus bungeanus			03			5	100	8	0.6	0.9	
			Lincoln-Oakes Nursery, Bismarck, ND			04			5	100	4	0.9	1.8	browse on all
						06			5	100	3	2.2	3.5	
						08			5	100	3	3.6	4.2	
I/8/11-15	9091971	PHME13	black chokeberry	11-May	05	05		5	5	100	3	1.7	2.1	
			Photinia melanocarpa			06			5	100	4	1.1	1.5	
			Bailey Nurseries, Inc., St. Paul, MN			07			5	100	5	0.9	1.4	browsed
						09			5	100	5	0.8	0.8	dieback on 1
I/8/16-20	9082678	AMCA6	leadplant	7-May	02	02	PLBR	5	5	100	6	0.6	1.5	
			Amorpha canescens			03			5	100	4	1.0	0.8	
			Lincoln-Oakes Nursery, Bismarck, ND			04			5	100	4	1.7	1.9	
						06			5	100	4	2.3	2.1	
						08			5	100	4	3.5	2.6	
I/09/1-10	Silver Sands	SAIN3	sandbar willow	1-May	90	90	CONT	10	10	100	2	4.4	3.5	
	Germplasm		*Salix interior*			91			10	100	2	6.8	5.0	
	ND-3902		NDSU			92			9	90	1	9.9	7.5	
	9035212		McKenzie Slough FEP			94			10	100	1	19.1	11.2	
						96			10	100		24.3	13.1	
						99			10	100	2	30.5	16.1	good growth and vigor
						04			10	100		30.0	16.0	minimum dieback
I/9/11-15	9082712	CESC	bittersweet	7-May	02	02	PLBR	5	5	100		0.8	1.2	mowed
			Celastrus scandens			03			5	100	3	1.2	2.0	
			Lincoln-Oakes Nursery, Bismarck, ND			04			5	100	3	1.7	3.1	suckers
						06			5	100		3.4	2.7	
						08			5	100	2	4.7	2.7	

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I/9/11-15	9082687	RIAM	black currant		01	01	PLBR	5	5	100	4	0.8	1.5	
			Ribes americanum			02			5	100		2.6	2.0	browsed
			Big Sioux Nursery, Watertown, SD			03			5	100	3	3.8	2.4	
						05			5	100	2	4.4	2.6	
						07			5	100	2	5.3	3.1	
I/10/1-20	'Regal'	PRTE*	Russian almond	29-Apr	80	80	PLBR	20	19	95		0.7	1.8	
	ND-283		*Prunus tenella*			81			20	100		1.8	2.7	
	9006079		ND Game & Fish Dept.			82			17	85	5	2.5	3.3	
	PI-540442		USDA, NRCS, PMC, Bismarck, ND			83			17	85		3.5	3.6	
			Increase Block			84			19	95	2	4.8	4.0	
						87			17	85	2	6.6	5.7	
						88			17	85	3	7.1	5.8	
						89			17	85	4	7.9	6.0	variable leaf size, color,
						94			20	100	3	12.0	6.8	form
						99			20	100		15.1	6.7	
						04			20	100	4	14.0	6.0	
I/11/1-10	ND-11	LOMA6	amur honeysuckle	28-Apr	81	81	CONT	10	10	100		0.7	1.1	
	9005993		*Lonicera maackii*			82			10	100	6	0.9	1.2	
	PI-477998		Res. Sta., Morden, Manitoba, Canada			83			9	90		1.6	1.8	
						84			10	100	3	3.7	3.1	
						85			10	100	4	4.9	4.7	
						87			10	100	2	7.3	6.8	
						88			9	90	2	8.9	7.0	excellent, heavy fruit crop,
						90			9	90	3	10.2	7.8	mildew on leaves
						95			9	90	3	14.0	10.4	
						00			9	90		18.1	13.8	
						05			8	80		20.0	12.8	good seed; some mildew
1/11/11-15	9082634	PRTI	rose tree of China	29-Apr	99	99	PLBR	5	4	80	5	1.1	1.7	
			Prunus triloba			00			4	80	6	2.1	1.7	
			Lawyer Nursery, Plains, MT			01			2	40	3	4.0	3.6	
						03			2	40	3	6.4	5.4	
						05			2	40	3	8.8	6.8	dieback on 2
						08			2	40	3	10.1	7.9	dieback on 2, 4 chlorotic

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PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
1/11/16-20	'Freedom'	LOKO2	honeysuckle		03	03	PLBR	5	5	100	3	3.5	3.4	
			Lonicera korolkowii			04			5	100	2	4.7	5.4	
			Lincoln-Oakes Nursery, Bismarck, ND			05			5	100	2	6.0	5.6	
						07			5	100	3	6.5	6.2	
						09			5	100	5	0.9	1.7	
I/12/1-10	'Indigo'	COAM2	silky dogwood	3-May	83	83	PLBR	10	9	90		0.9	1.8	
	Mich-765		*Cornus amomum*			84			10	100	2	3.8	3.1	
	9004971		USDA, NRCS, PMC, Rose Lake, MI			85			10	100	2	5.6	4.9	
	PI-468117					87			10	100	1	10.0	7.4	
						92			10	100	2	13.5	9.3	
						97			10	100	1	21.3	10.5	excellent
1/12/11-15	9091969	CAFR80	Russian peashrub	May	07	07		5	5	100	6	0.4	1.5	
			Caragana frutex			08			5	100	6	0.5	1.6	deer browse on 1
			Big Sioux Nursery, Watertown, SD											
1/12/16-20	9082738	CORA6	gray dogwood		03	03	PLBR	5	5	100	4	0.5	1.3	
			Cornus racemosa			04			5	100	4	1.0	1.5	browse on all
			Wisconsin			05			5	100	3	2.0	1.9	
			Lincoln-Oakes Nursery, Bismarck, ND			07			5	100	4	2.9	2.6	
						09			5	100	4	3.1	2.7	
1/13/10-15	9082706	ROAR3	prairie rose		03	03	PLBR	5	5	100	3	1.2	1.0	
			Rosa arkansana			04			5	100		1.6	1.8	
			Bismarck			05			5	100	5	2.2	1.8	1 mowed, 5 wood rose contam.
			Lincoln-Oakes Nursery, Bismarck, ND			07			4	80		0.9	0.9	5 wood rose contamination
						09			2	40		1.6	1.3	
1/13/16-20	9082746	RIMI	Missouri gooseberry		03	03	PLBR	5	5	100	3	1.4	1.2	
			Ribes missouriense			04			5	100	4	2.5	3.0	fall color, burgundy
			Big Sioux River			05			5	100	4	3.6	3.1	red, good color
			Big Sioux Nursery, Watertown, SD			08			5	100	4	3.9	3.5	
						09			5	100	6	2.9	2.8	

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i/14/1-5	9083241	PRAM	plum	May	07	07		5	3	60		0.3	0.9	
	'Midwest Premium'		*Prunus americana*			08			3	60	7	0.6	1.1	all browsed, dieback
			USDA, NRCS, PMC, Elsberry, MO			09			3	60	6	1.3	1.7	
I/14/6-10	9082891	PHOP	common ninebark	19-May	04	04	PLBR	5	5	100	5	0.6	1.1	browse on 1
			Physocarpus opulifolius			05			4	80	4	3.5	2.8	
			Big Sioux Nursery, Watertown, SD			06			4	80	3	2.5	2.9	leaf blight on 1
						07			4	80	3	4.6	4.6	
I/14/11-15	9082890	CORA6	gray dogwood	19-May	04	04	PLBR	5	5	100	5	0.5	1.3	heavy leaf spot
			Cornus racemosa			05			5	100	5	1.5	1.5	heavy leaf spot
			Big Sioux Nursery, Watertown, SD			06			5	100	5	1.5	2.1	
						08			5	100	5	2.0	2.6	all leaf spot except 3
1/14/16-20	9082684	RHGL	smooth sumac		03	03	PLBR	5	2	40	4	1.5	1.4	
			Rhus glabra			04			3	60		1.8	2.0	
			Lincoln-Oakes Nursery, Bismarck,ND			05			5	100	5	1.5	2.2	leaf spot
						07			5	100	3	5.6	4.3	
						09			5	100	4	8.9	5.3	
I/15/1-5	9091967	PRPE2	pin cherry	11-May	05	05		5	5	100	4	0.9	1.8	
			Prunus pensylvanica			06			5	100	5	0.5	1.6	
			Big Sioux Nursery, Watertown, SD			07			4	80	6	0.3	1.1	
						09			3	60	7	1.5	0.8	
I/15/6-10	'Sun Harvest'	COAM	American hazelnut	May	07	07			3	60	5	0.3	0.6	
	9083247		*Corylus americana*			08			3	60	7	0.2	0.3	removed
			USDA, NRCS, PMC, Elsberry, MO											
I/15/6-10	9094281	VIOPA	American highbush cranberry	7-May	09	09		5	5	100	5	1.1	1.6	browsed
			Viburnum opulus var. *americanum*											
			Big Sioux Nursery, Watertown, SD											
I/15/11-15	9076686	CRCH	roundleaf hawthorn	19-May	04	04		5	5	100	5	0.4	0.6	
			Crataegus chrysocarpa			05			5	100	4	0.8	1.0	deer browse
			Lincoln-Oakes Nursery, Bismarck ND			06			5	100	6	0.5	1.1	chlorosis, browse 1
						08			5	100	5	0.3	0.9	all browsed

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I/15/16-20	9082888	COAM3	American hazelnut	19-May	04	04		5	5	100	4	0.6	1.2	
			Corylus americana			05			5	100	5	0.9	1.3	scald on leaves
			Lincoln-Oakes Nursery, Bismarck ND			06			5	100	4	1.1	1.3	
						08			5	100	4	1.1	1.3	
I/16/1-5	'Konza'	RHAR	aromatic sumac	28-Apr	87	87	CONT	5	5	100		0.8	1.2	
	PI-477981		*Rhus aromatica*			88			5	100	3	1.2	1.7	
			USDA, NRCS, PMC, Manhattan, KS			89			3	60	2	3.1	2.8	
						91			2	40	2	6.6	4.3	
						93			2	40	3	9.8	5.8	
						96			2	40	4	13.5	6.1	
						01			1	20	3	12.0	8.5	
						06			1	20	3	16.0	9.0	
I/16/11-20	ND-3744	BEKO	Korean barberry	4-May	88	88	CONT	10	0	0				
	9019577		*Berberis koreana*			89			10	100	4	0.7	0.9	
			NDSU			90			10	100	3	1.4	2.0	
			McKenzie FEP, ND			92			10	100	4	3.5	3.0	
						94			10	100	3	4.5	4.8	
						97			10	100	3	6.8	5.7	
						02			10	100		10.5	8.5	
						07			8	80		11.0	9.0	
I/17/1-10	'Meadowlark'	FOOV	forsythia	4-May	88	88	CONT	10	9	90	4	1.2	1.4	
	9005886		*Forsythia ovata x europaea*			89			10	100	1	3.1	2.6	
			P.I. Sta., Ames, IA			90			9	90	2	4.4	4.2	
			Lincoln-Oakes Nursery, Bismarck, ND			92			9	90	2	6.0	6.6	
						94			9	90	1	9.1	7.8	
						97			10	100	1	14.3	9.5	very uniform
						02			9	90	2	16.0	11.0	uniform
						07			9	90	2	18.0	13.0	very uniform

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I/17/11-20	ND-2103	VIOP	European cranberrybush	4-May	88	88	POTD	10	0	0				
	PI-399414		*Viburnum opulus*			89			8	80	3	0.7	1.0	
			P.I. Sta., Ames, IA			90			5	50	3	1.7	2.2	
			NDSU, Exp. Sta., Dickinson, ND			92			4	40	3	3.6	4.3	
						94			4	40	4	6.5	6.4	
						97			4	40	1	12.0	8.0	
						02			4	40	2	15.0	11.8	
						07			4	40	2	19.5	14.3	
I/18/1-10	ND-2507	CAPY	pigmy caragana	4-May	88	88	POTD	10	9	90	7	0.2	0.5	
	9047228		*Caragana pygmaea*			89			6	60	5	0.6	0.8	
			NDFS, Bottineau, ND			90			8	80	3	0.9	1.2	
			USDA, NRCS, PMC, Bismarck, ND			92			7	70	3	2.8	2.3	
						94			7	70	3	4.2	3.6	
						97			7	70	3	6.4	4.3	
						02			4	40	4	7.5	5.3	
						07			3	30	7	9.3	5.1	7 stem mold
1/18/6-10	9082895	PRAR3	apricot	May	07	07		5	1	20	8	0.3	0.3	
			Prunus armeniaca			08			0	0				all dead
			Rod O'Clair, Jamestown, ND											
			USDA, NRCS, PMC, Bismarck, ND											
I/18/11-15	9091976	VIDE	arrowwood viburnum	11-May	05	05		5	5	100	4	0.8	1.4	
			Viburnum dentatum			06			5	100	4	0.7	1.4	all browsed
			Lincoln-Oakes Nursery, Bismarck, ND			07			3	60	4	1.2	1.4	all browsed
						09			3	60		1.9	2.2	
I/19/1-10	9057409	COAM3	American hazel	4-May	88	88	PLBR	10	1	10	9	0.2	1.1	
			Corylus americana			89			8	80	4	0.6	1.1	
			Turtle Mtns., Bottineau Co., ND			90			6	60	5	1.1	1.2	
			NDFS			92			6	60	3	2.0	2.0	
						94			6	60	3	4.1	3.8	
						97			6	60	1	7.0	5.8	
						02			6	60	4	11.5	8.5	
						07			6	60	4	13.0	10.3	

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I/19/11-20	'Hedge King'	LOXY	honeysuckle	4-May	88	88	PLBR	10	8	80	7	0.5	0.9	
	9057407		*Lonicera xylosteoides*			89			9	90	5	0.7	1.0	
			Wedge Nursery, Albert Lea, MN			90			8	80	3	1.1	1.2	
						92			8	80	3	1.5	1.8	
						94			8	80	5	1.8	2.3	
						97			8	80	1	2.4	3.2	
						02			5	50	5	3.8	5.6	
						07			5	50	5	4.0	5.0	
II/03/1-10	ND-1731	MABA	Siberian crabapple	10-May	78	78	PLBR	10	10	100	5	1.0	2.2	standard
	9006001		*Malus baccata*			79			10	100	3	2.2	3.1	
			Lincoln-Oakes Nursery, Bismarck, ND			80			10	100		3.9	5.0	
						82			10	100		5.5	8.0	
						83			9	90		6.2	8.7	fire blight
						84			9	90	7	8.1	10.4	
						87			9	90	4	11.2	14.2	
						88			9	90	4	13.1	13.9	
						92			9	90	4	16.7	15.4	
						97			9	90	1	27.2	19.7	
						02			9	90	3	32.0	28.0	
						07			9	90	3	36.0	25.8	1 not Siberian
II/04/1-10	'McDermand'	PYUS	Ussurian pear	10-May	78	78	PLBR	10	10	100	5	0.7	2.0	
	ND-14		*Pyrus ussuriensis*			79			10	100	5	1.6	2.6	
	9006095		Harbin Manchuria/Res. Sta.			80			10	100		2.2	4.1	
	PI-478004		Morden, Manitoba, Canada			82			10	100		2.9	5.2	
			USDA, NRCS, PMC, Bismarck, ND			83			6	60		4.0	6.9	
						84			6	60		5.0	8.4	
						87			6	60	5	7.9	11.9	
						88			6	60	3	11.6	13.9	
						92			6	60	3	16.3	16.4	
						97			6	60	1	24.6	23.0	
						02			6	60	1	26.0	26.0	
						07			6	60	3	30.0	30.0	

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II/05/1-10	'Streamco'	SAPU2	purpleosier willow	1-May	90	90	PLBR	10	10	100	3	5.2	2.6	
	434309		*Salix purpurea*			91			10	100	3	7.5	4.1	
			USDA, NRCS, PMC, Big Flats, NY			92			10	100	4	10.7	8.3	tipping by deer
						94			10	100	2	17.1	12.1	
						96			10	100		9.5	15.4	
						99			10	100	2	22.0	17.7	
						04			10	100	4	27.0	19.0	deer browse line
II/07/1-10	ND-21	VILE	nannyberry	29-Apr	86	86	PLBR	10	10	100		0.8	1.5	
	9034900		*Viburnum lentago*			87			10	100	3	1.4	2.9	
			USDA, ARS, Mandan, ND			88			10	100	3	2.1	3.8	
						90			10	100	3	4.5	5.0	
						92			10	100	3	5.4	6.2	some suckering on all
						95			10	100	2	7.7	7.8	
						00			10	100	3	10.5	10.1	mildew
						05			10	100	3	13.0	13.0	average moderate mildew
II/8/1-5	9082609	PICEA	Meyer's spruce		01	01	CONT	5	4	80	5	0.5	0.7	
			Picea meyeri			02			4	80	2	0.7	0.9	
			Itasca Greenhouse, Inc.			03			4	80	3	1.3	1.4	
						05			4	80	5	2.0	2.7	
						07			4	80	4	3.4	3.8	
II/08/6-10	9076741	SAMA13	Libbon willow	30-Apr	96	96	HDCU	5	5	100	4	2.6	2.4	severe deer browse
			Salix matsudana x			97			5	100	9	1.9	2.5	
			George Libbon, Stevens Co., MN			98			3	60	7	2.7	3.8	
						00			1	20	2	13.4	22.3	
						02			1	20	3	18.0	26.0	compact growth
						06			1	20	2	30.0	39.3	
II/8/6-10	9092053	RHTY	staghorn sumac	3-May	06	06	PLBR	5	3	60	4	1.6	1.9	
			Rhus typhina			07			3	60	3	3.5	4.1	
			Lincoln-Oakes Nursery, Bismarck, ND			08			3	60	5	1.8	3.0	
II/09/1-5	9092053	ELAEA	Russian olive/Silverberry hybrid	3-May	06	06	PLBR	5	5	100	2	1.3	3.1	
			Elaeagnus X 'Jefmorg'			07			5	100	2	5.3	5.7	
			Lincoln-Oakes Nursery, Bismarck, ND			08			5	100	2	9.3	8.9	no disease

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II/09/6-10	9069129	PRMA	amur chokecherry	26-Apr	95	95	PLBR	5	5	100	3	0.9	2.0	
			Prunus maackii			96			4	80	3	1.3	2.4	deer browse on all
			Big Sioux Nursery, Watertown, SD			97			4	80	4	1.6	3.1	browsed
						99			3	60	5	2.0	3.6	browsed
						01			3	60	4	5.0	8.6	
						04			3	60	4	7.8	13.3	
						09			3	60	4	13.1	17.8	
II/9/6-10	9092141	VILE	nannyberry	May	07	07		5	5	100	5	0.3	1.1	
			Viburnum lentago			08			5	100	6	0.3	0.9	leaf spot on all
			Schumacher's, Heron Lake, MN			09			5	100	5	0.9	0.8	leaf spot on all
II/10/1-10	ND-2102	PRAR3	apricot	29-Apr	86	86	PLBR	10	10	100		1.2	1.6	
	9036029		*Prunus armeniaca*			87			10	100	3	2.5	3.1	
			Hand Co., SD			88			10	100	5	3.2	4.3	
						90			10	100	3	5.9	7.1	
						92			10	100	4	9.2	11.3	canker, deer browse on all
						95			10	100	3	13.9	14.4	
						00			8	80	5	18.4	15.1	
						05			6	60		27.5	17.8	
II/11/1-5	9092140	SOAL9	Korean mountain ash	May	07	07		5	5	100	6	0.3	0.9	browsed
			Sorbus alnifolia			08			1	20	7	0.3	1.5	removed
			Big Sioux Nursery, Watertown, SD											
II/11/6-10	'Cathedral'	ULMUS	Siberian/Japanese elm cross	May	07	07		5	5	100	3	3.6	8.3	
	9092142		*Ulmus X* 'cathedral'			08			5	100	4	2.8	7.9	5 knocked over
			Bailey Nursery, Inc., St. Paul, MN			09			4	80	3	3.6	9.8	
			S & B Nursery, Bismarck, ND											
II/12/1-5	9082631	BEPLJ	Japanese birch	29-Apr	99	99	PLBR	5	5	100	3	0.7	2.6	
			Betula platyphylla japonica			00			5	100	3	3.3	4.4	
			Lawyer Nursery, Plains, MT			01			5	100	2	5.7	7.5	
						03			5	100	3	8.5	13.1	
						05			5	100	3	9.4	16.5	
						08			5	100	3	10.3	18.6	

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II/12/5-10	9091974	QURU	red oak	11-May	05	05		5	5	100	4	0.4	1.5	chlorotic
			Quercus rubra			06			5	100	5		1.9	3 top dead
			Lincoln-Oakes Nursery, Bismarck, ND			07			5	100	4		2.0	in tubex
						09			5	100	4	0.5	2.4	
II/13/1-5	9082635	ROPS	black locust	29-Apr	99	99	PLBR	5	5	100	3	2.4	4.2	
			Robinia pseudoacacia			00			5	100	5	2.7	3.9	
			Lawyer Nursery, Plains,MT			01			5	100	6	3.8	4.5	
						03			2	40	6	10.0	8.9	
						06			2	40	3	18.3	17.9	multi-stemmed
						08								needs to be removed
II/13/6-10	9091973	QURU	red oak	11-May	05	05		5	5	100	5	0.5	1.4	
			Quercus rubra			06			5	100			1.5	1,3 dead top; leaf disease on all
			Lincoln-Oakes Nursery, Bismarck, ND			07			4	80	5		1.3	2,3 dieback, all in tubex
						09			4	80	5	0.3	1.8	
II/14/1-5	9076718	PISYM	Scots pine	29-Apr	99	99	CONT	5	5	100	3	0.7	1.2	
			Pinus sylvestris var. *mongolica*			00			5	100	3	1.5	1.8	
			USDA, NRCS, PMC, Bismarck, ND			01			5	100	2	2.5	3.0	
						03			5	100	3	5.0	6.8	
						05			5	100	2	7.2	10.6	
						08			5	100	2	11.6	15.4	
II/14/6-10	9076719	PISYM	Scots pine	29-Apr	99	99	CONT	5	5	100	2	1.0	1.3	
			Pinus sylvestris var. *mongolica*			00			5	100	3	1.6	1.9	
			USDA, NRCS, PMC, Bismarck, ND			01			5	100	2	2.3	2.9	
						03			5	100	3	4.8	6.0	
						05			5	100	3	7.2	10.0	
						08			5	100	2	11.8	15.5	

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II/15/1-5	9076737	PRSE	black cherry	12-May	97	97	PLBR	5	4	80	8	0.3	0.5	
			Prunus serotina			98			2	40	8	0.8	0.8	
			Apple Valley FEP			99			1	20		1.8	2.3	
			Lincoln-Oakes Nursery, Bismarck, ND			00			1	20	5	4.1	4.3	
						01			1	20		5.5	6.5	
						03			1	20	3	8.0	12.0	
						06			1	20	2	11.5	17.2	
II/15/6-10	9069163	LARIX	Dahurian larch	2-May	00	00		5	5	100	7	0.8	1.1	
			Larix olgensis			01			4	80	6	0.9	1.6	
			USDA, NRCS, PMC, Bismarck, ND			02			3	60	2	1.5	2.0	
						04			3	60		2.2	3.1	
						06			3	60	5	4.1	4.5	deer rub
						09			3	60	6	5.8	4.9	
II/16/1-5	9076722	BEPE3	European white birch	30-Apr	96	96	PLBR	5	5	100	3	2.4	2.8	
			Betula pendula			97			5	100	2	3.5	4.6	
			Russia			98			4	80	3	7.0	9.2	
			USDA, ARS, Mandan, ND			00			5	100	2	10.2	15.8	
						02			5	100	3	16.0	21.0	
						05			5	100	2	14.8	27.5	
II/16/6-10	9069121	PRPA5	mayday	30-Apr	96	96	CONT	5	5	100	4	0.5	0.9	
			Prunus padus			97			5	100	3	0.8	1.2	
			Norway			98			5	100	7	1.1	1.2	
			USDA, NRCS, PMC, Bismarck, ND			00			2	40	3	2.8	3.9	
						02			2	40	4	4.2	6.6	
						05			2	40	4	5.4	9.5	
II/17/1-5	9069170	QURO2	English oak	30-Apr	96	96	PLBR	5	4	80	4	0.9	1.0	
			Quercus robur			97			5	100	3	1.1	1.3	
			Russia			98			5	100	6	1.2	1.3	
			USDA, ARS, Mandan, ND			00			5	100	7	1.0	1.1	
						02			4	80	8	2.4	2.6	
						05			4	80	6	3.3	4.5	

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II/17/6-10	9076725	ULCA	smoothbark elm	30-Apr	96	96	PLBR	5	5	100	4	2.3	2.0	deer browse on all
			Ulmus carpinifolia			97			5	100	2	3.6	2.5	all browsed
			Russia			98			5	100	4	5.3	3.9	
			USDA, ARS, Mandan, ND			00			3	60	3	8.9	11.8	
						02			3	60	4	15.0	17.7	
						05			2	40	2	23.5	27.5	good form on both
II/18/1-5	9069168	LASI	Siberian larch	2-May	00	00	CONT	5	5	100	5	0.6	1.4	
			Larix sibirica			01			4	80	4	0.9	1.8	
			USDA, NRCS, PMC, Bismarck, ND			02			4	80	3	1.3	2.3	
						04			3	60	5	2.6	3.8	deer rub
						09			3	60	4	6.6	8.8	
II/18/6-10	9082610	LASI	Siberian larch	2-May	00	00	CONT	5	5	100	6	0.6	1.1	
			Larix sibirica			01			4	80	5	0.8	1.2	
			USDA, NRCS, PMC, Bismarck, ND			02			5	100	5	1.1	1.4	
						04			5	100	5	1.2	2.4	
						06			5	100	5	2.1	2.2	
						09			5	100		2.6	2.8	
II/19/1-5	9063126	ULJA	Japanese elm	28-Apr	92	92	CONT	5	5	100	4	1.1	1.3	
			Ulmus japonica			93			4	80	3	1.3	1.2	
			Manchuria			94			4	80	5	2.6	2.2	
			PRFA, Indianhead, Saskatchewan, Canada			96			4	80	4	4.3	3.2	deer browse 1, leaf blight 3
						98			4	80	5	4.2	4.9	
						01			4	80	5	7.8	8.1	heavy browse
						06			4	80	4	11.1	12.9	
II/19/6-10	9092051	CASP8	northern catalpa	3-May	06	06	PLBR	5	5	100	3	0.6	0.9	leaf edge burn
			Catalpa speciosa			07			5	100	5	0.4	0.9	
			Big Sioux Nursery, Watertown, SD			08			5	100	3	0.8	1.2	
II/20/1-5	9082666	BEDA	black birch		01	01	PLBR	5	5	100	2	2.0	1.9	
			Betula davurica			02			5	100	3	2.8	3.0	
			Lawyer Nursery, Plains, MT			03			4	80	4	4.4	5.2	
						05			4	80	5	5.7	8.3	
						07			4	80	4	7.6	12.1	

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II/20/6-10	9092052	QUBI	swamp white oak	3-May	06	06	PLBR	5	5	100	3	0.7	1.1	
			Quercus bicolor			07			5	100	4	0.5	1.0	browsed
			Lincoln-Oakes Nursery, Bismarck, ND			08			5	100	5	0.7	1.0	
II/21/1-10	'Flame'	ACGI	amur maple	29-Apr	80	80	PLBR	10	10	100	5	2.8	3.3	
	MI-891		*Acer ginnala*			81			10	100		4.7	4.6	
	9005157		USDA, NRCS, PMC, Elsberry, MO			82			10	100		6.5	6.0	
						83			10	100		7.0	6.3	
						84			9	90	4	12.2	8.6	chlorosis
						87			8	80	2	16.8	12.9	
						92			8	80	3	22.2	15.8	
						97			7	70	2	26.2	18.4	
						02			5	50	4	31.0	23.5	
						07			0	0				mostly dead, need to remove
II/22/1-10	ND-1752	ACGI	amur maple	23-May	78	78	PLBR	10	9	90	5	0.6	1.2	standard
	9005646		*Acer ginnala*			79			8	80	4	1.9	2.6	
			Gurney Seed & Nursery Co., Yankton, SD			80			10	100	6	3.2	3.4	
						82			8	80		8.1	7.0	
						83			8	80		11.0	8.1	
						84			8	80	2	12.9	10.5	chlorosis
						87			8	80	2	16.5	13.1	
						92			8	80	2	20.4	15.2	
						97			8	80	4	20.8	20.0	
						02			6	60	5	16.3	17.7	
II/22/11-20	ND-629	ACGI	amur maple	14-May	79	79	PLBR	10	10	100	3	0.9	1.8	
	9005645		*Acer ginnala*			80			10	100	5	2.2	3.5	
	PI-477992		Res. Sta. Morden, Manitoba, Canada			81			10	100		4.3	5.1	
						83			10	100		7.2	7.1	
						84			9	90	3	12.5	9.7	
						85			9	90	3	13.5	10.7	chlorosis
						87			9	90	3	16.9	13.7	
						93			9	90	3	21.2	17.3	
						98			9	90	5	23.7	20.2	
						08								to be removed

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II/23/1-10	ND-1873	ACGI	amur maple	15-May	79	79	PLBR	10	9	90	3	0.7	1.4	
	9005648		*Acer ginnala*			80			10	100	6	1.2	2.3	
			Lincoln-Oakes Nursery, Bismarck, ND			81			10	100		2.2	0.3	
						83			10	100		3.8	3.7	
						84			9	90	4	6.2	5.2	
						85			8	80	6	8.0	6.5	
						87			8	80	5	9.9	9.1	
						88			8	80	4	9.9	8.8	
						93			8	80	4	14.3	13.2	
						98			8	80	6	14.2	14.7	
						04			2	20		22.5	19.5	chlorotic
						08								to be removed
II/24/1-10	ND-686	SYREP	pekin lilac	14-May	79	79	PLBR	10	9	90	4	0.5	1.0	
	9006225		*Syringa reticulata* ssp. *pekinensis*			80			10	100	7	0.6	1.0	
	PI-478008		Res. Sta., Morden, Manitoba, Canada			81			9	90		1.2	1.3	
			USDA, NRCS, PMC, Bismarck, ND			83			9	90		2.5	2.5	
						84			9	90	4	4.0	3.2	
						85			6	60	4	6.6	5.4	
						88			6	60		8.9	8.0	
						93			6	60	2	15.7	13.5	
						98			6	60	3	17.4	14.4	
						08			6	60		30.0	16.0	
II/26/1-10	ND-19	CRAR	Arnold hawthorn	1-May	84	84	CONT	10	10	100	3	0.5	1.0	
	9005731		*Crataegus arnoldiana*			85			10	100	3	0.8	1.3	
			Res. Sta., Morden, Manitoba, Canada			86			10	100		1.1	1.7	
						87			10	100	3	1.4	2.1	
						88			10	100	5	1.6	2.8	
						90			10	100	4	2.9	4.1	
						93			10	100	4	4.5	7.0	
						98			10	100	6	6.7	9.8	
						04			10	100	5	7.4	9.9	
						08			10	100	5	14.0	13.0	

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III/01/1-10	SD-156	FRPE	green ash	10-May	78	78	PLBR	10	8	80	3	0.8	2.5	
	9005890		*Fraxinus pennsylvanica*			79			10	100	5	2.3	2.7	
			Deuel Co., Clear Lake, SD			80			10	100		2.7	4.7	
						82			10	100		6.8	8.9	
						83			10	100		6.5	9.9	
						84			10	100		8.3	12.4	
						87			10	100	2	11.6	18.2	
						92			10	100	2	15.7	23.8	
						97			10	100	1	24.9	31.3	
						02			10	100	3	32.0	46.0	
						07			10	100	2	40.0	52.0	
III/02/1-5	ND-1753	FRPE	green ash	10-May	78	78	PLBR	5	5	100	2	0.9	2.3	standard
	9005892		*Fraxinus pennsylvanica*			79			5	100	5	2.3	3.2	
			Gurney Seed & Nursery Co., Yankton, SD			80			5	100		3.2	4.9	
						82			5	100		5.8	8.7	
						83			5	100		5.7	9.8	
						84			5	100		7.3	12.0	
						87			5	100	2	10.7	18.6	
						92			5	100	3	14.2	24.0	
						97			5	100	2	24.0	32.2	
						02			4	80	4	30.0	45.0	
						07			4	80	4	35.0	51.0	
III/02/6-10	ND-1734	FRPE	green ash	10-May	78	78	PLBR	5	5	100	3	0.8	2.0	standard
	9005891		*Fraxinus pennsylvanica*			79			5	100	5	1.7	2.4	
			Lincoln-Oakes Nursery, Bismarck, ND			80			5	100		2.1	4.0	
						82			5	100		5.1	8.4	
						83			5	100		4.4	9.4	
						84			5	100		6.2	12.0	
						87			5	100	3	10.6	18.2	
						92			5	100	1	14.6	23.7	
						97			5	100	3	17.4	30.0	
						02			5	100	3	30.0	46.0	
						07			5	100	4	35.0	51.0	

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III/03/1-10	'Cardan'	FRPE	green ash	10-May	78	78	PLBR	10	10	100	2	0.7	2.3	
	MDN-12002		*Fraxinus pennsylvanica*			79			10	100	5	1.9	3.2	
	9005895		Carlyle, MT			80			10	100		2.7	4.8	
	PI-469226		USDA, ARS, Mandan, ND			82			10	100		5.8	8.7	
						83			10	100		5.1	9.7	
						84			10	100		6.5	11.5	
						87			10	100	3	11.3	17.7	
						92			10	100	2	15.4	23.5	
						97			10	100	3	17.7	30.1	
						02			10	100	3	30.0	46.0	
						07			10	100	4	35.0	46.0	
III/04/1-10	ND-1759	FRPE	green ash	10-May	78	78	PLBR	10	10	100	2	0.8	2.2	
	9005893		*Fraxinus pennsylvanica*			79			10	100	6	1.7	2.7	
			PM-SD-156 X MDN-12002			80			10	100		2.4	4.4	
			USDA, NRCS, PMC, Bismarck, ND			82			10	100		3.9	7.6	
						83			9	90		4.7	9.1	
						84			9	90		5.8	11.3	regrowth on 5
						87			9	90	3	10.6	16.9	
						92			9	90	1	14.4	23.5	
						97			9	90		17.9	31.2	
						02			9	90	3	30.0	46.0	
						07			9	90	4	30.0	46.0	
III/05/1-10	ND-647	FRNI	black ash	10-May	78	78	PLBR	10	8	80	5	0.5	1.0	
	9005887		*Fraxinus nigra*			79			9	90	9	0.8	0.9	
			Res. Sta. Morden, Manitoba, Canada			80			9	90	7	0.7	1.3	
						82			8	80		2.2	3.7	
						83			8	80		2.7	4.6	
						84			6	60		2.4	7.3	
						87			6	60	3	4.6	12.1	
						92			5	50	2	10.1	20.0	
						97			5	50	3	18.2	25.5	
						02			5	50	3	25.0	40.0	

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III/06/1-10	ND-1432	AEGL	Ohio buckeye	10-May	78	78	PLBR	10	7	70	7	0.3	0.7	
	9005658		*Aesculus glabra*			79			1	10	9	0.7	0.7	
			Res. Sta. Morden, Manitoba, Canada			80			1	10	5	0.7	1.0	
						82			1	10		2.0	3.1	
						83			1	10		1.6	4.4	
						84			1	10		2.3	5.7	
						87			1	10	2	5.9	9.8	
						92			1	10	1	11.6	13.6	
						97			1	10	2	15.1	16.2	
						02			1	10	2	20.0	20.0	
						07			1	10	2	21.0	25.0	
III/06/6-10	9063120	AEGL	Ohio buckeye	29-Apr	99	99	CONT	5	5	100	7	0.2	0.8	
			Aesculus glabra			00			2	40	8	0.1	0.4	
			USDA, NRCS, PMC, Bismarck, ND			01			1	20	8	0.8	1.0	
						03			1	20	6	2.0	2.0	
						05			1	20		1.6	1.6	
						08			0	0				dead
III/07/1-10	9057410	CEOC	hackberry	4-May	88	88	CONT	10	10	100	5	0.6	1.0	
			Celtis occidentalis			89			9	90	5	0.6	0.9	browsing
			Bottineau Co., ND			90			8	80	4	1.1	1.6	
			NDFS			92			8	80	5	1.2	1.8	
						94			8	80	4	1.6	2.8	
						97			7	70	6	1.6	2.1	deer browse on all
						02			7	70	5	3.5	4.4	
						07			6	60	5	4.5	7.2	deer browse on all
III/08/1-5	9063148	PHSA	corktree	26-Apr	95	95	CONT	5	5	100	4	0.2	1.0	
			Phellodendron sachalinense			96			5	100	3	3.0	3.2	deer browse on 1
			Clay Co., MN			97			5	100	1	4.3	5.0	
						99			5	100	4	11.4	8.8	
						01			5	100	3	14.5	12.7	
						04			5	100	4	21.0	17.5	
						09			5	100	4	28.8	20.0	

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III/08/6-10	'Oahe'	CEOC	hackberry *Celtis occidentalis*	7-May	09	09		5	5	100	3	0.5	1.9	
III/08/11-15	Prairie Harvest Germplasm 9034956 ND-3878	CEOC	hackberry *Celtis occidentalis* Polk Co., Minnesota	7-May	09	09		5	5	100	3	0.5	2.6	
III/9/1-5	9082668	FREX	European ash *Fraxinus excelsior* Lawyer Nursery, Plains, MT	2-May	00	00	CONT	5	5	100	6	0.6	2.1	
						01			5	100	6	1.1	1.8	browsed
						02			5	100	5	1.8	2.8	
						04			5	100	6	1.1	2.0	
						06			5	100	6	1.4	2.6	
						09			5	100	7	1.9	1.9	
III/9/6-10	9082674	ACSA	sugar maple *Acer saccharum* Lincoln-Oakes Nursery, Bismarck, ND	2-May	00	00	CONT	5	5	100	8	0.3	1.1	
						01			5	100	9	0.2	1.2	
						02			2	40	8	0.5	0.5	
						04			2	40		0.9	1.1	
						06			1	20	8	0.8	0.8	
						09			0	0				
III/10/1-5	9058896 Clone C	SALIX	Austree *Salix matsudana x alba* Austree, Inc., Pescadero, CA	1-May	90	90	PLBR	5	2	40	3	1.8	4.1	
						91			3	60	4	2.7	5.2	
						92			3	60	3	4.1	7.7	
						94			3	60	6	9.2	13.5	
						97			2	40	2	19.8	30.8	
						99			2	40	2	23.1	39.4	
						04			2	40	3	30.0	49.0	
						09			2	40	2	38.0	52.0	

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III/11/1-5	9058869	PDXP8	poplar	1-May	90	90	PLBR	5	5	100	3	2.1	4.9	
	14271		*Populus deltoides x P. nigra*			91			5	100	3	4.4	7.3	
	'Italica' #78102		USDA, ARS, Mandan, ND			92			5	100	3	5.8	10.3	
			Lincoln-Oakes Nursery, Bismarck, ND			94			5	100	3	10.6	18.8	
						96			5	100	3	14.0	30.4	
						99			5	100	2	15.1	44.9	
						04			5	100	4	18.0	58.6	
						09			5	100	3	12.0	60.0	
III/11/6-10	9058870	PDXP8	poplar	1-May	90	90	PLBR	5	5	100	3	3.1	5.0	
	14272		*Populus deltoides x P. nigra*			91			5	100	5	4.1	6.5	
	'Italica' #78101		USDA, ARS, Mandan, ND			92			5	100	5	5.9	9.8	
			Lincoln-Oakes Nursery, Bismarck, ND			94			4	80	4	10.0	17.0	
						96			4	80	4	13.6	24.4	
						99			4	80	3	14.8	42.6	
						04			4	80	3	21.0	63.3	
						09			4	80	4	15.0	60.0	
III/12/1-5	9058871	PDXP8	poplar	1-May	90	90	PLBR	5	5	100	2	2.8	5.1	
	14273		*Populus deltoides x P. nigra*			91			5	100	3	6.0	9.6	
	'Italica' #7899		USDA, ARS, Mandan, ND			92			5	100	3	9.0	13.7	
			Lincoln-Oakes Nursery, Bismarck, ND			94			5	100	3	15.3	22.2	
						96			5	100	3	17.4	33.4	
						99			5	100	2	19.0	45.9	
						04			5	100	3	21.0	61.2	
						09			4	80	6		55.0	
III/12/6-10	9058872	PDXP8	poplar	1-May	90	90	PLBR	5	5	100	3	3.7	4.6	
	14274		*Populus deltoides x P. nigra*			91			5	100	3	7.5	9.1	
	'Italica' #7873		USDA, ARS, Mandan, ND			92			5	100	3	8.5	10.4	
			Lincoln-Oakes Nursery, Bismarck, ND			94			5	100	5	12.7	18.2	
						96			5	100	5	15.5	26.8	leaf spot on 1
						99			5	100		14.4	40.3	
						04			3	60	5	20.0	34.7	

Project No.: 38I318K University of Minnesota, West Central Research and Outreach Center, Morris, Minnesota
Year of Record: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
III/13/1-5	'Canam'	POPUL	poplar	1-May	90	90	PLBR	5	5	100	4	3.1	4.2	
	9058873		*Populus*			91			5	100	5	6.0	8.8	
	14390		USDA, ARS, Mandan, ND			92			5	100	4	5.6	9.7	
			Lincoln-Oakes Nursery, Bismarck, ND			94			3	60	6	9.4	19.2	
						96			3	60	6	11.2	24.0	
						99			3	60	4	12.0	36.5	
						04			3	60	3	18.0	54.7	
						09			3	60	4	20.0	53.3	
III/14/1-5	9082982	POAL	white poplar	19-May	04	04	PLBR	5	5	100	3	0.6	1.7	
			Populus alba			05			5	100	6	1.0	1.7	
			Big Sioux Nursery, Watertown, SD			06			4	80	4	1.3	1.9	
						08			4	80	5	2.3	2.5	
III/14/6-10	9076746	AEGL	Ohio buckeye	2-May	00	00	CONT	5	5	100	7	0.3	0.7	
			Aesculus glabra			01			3	60		0.0	0.9	
			USDA, NRCS, PMC, Bismarck, ND			02			3	60	4	1.5	1.5	
						04			3	60	3	2.0	2.7	
						06			3	60	3	3.7	4.5	
						09			3	60		3.8	6.8	
III/15/1-10	'Oahe'	CEOC	hackberry	29-Apr	80	80	PLBR	10	10	100	6	0.4	1.9	
	MDN-12003		*Celtis occidentalis*			81			10	100		1.4	2.1	
	9005725		USDA, ARS, Mandan, ND			82			10	100		3.0	3.6	
	PI-476982					83			10	100		4.9	5.2	
						84			10	100	3	5.3	7.3	
						86			10	100	4	9.4	10.1	
						89			10	100	2	13.5	15.8	plt 2 stunted, deer browse
						94			10	100	3	14.5	20.7	
						99			10	100	2	18.0	26.4	
						04			10	100	3	18.0	32.2	
						09			10	100	3	21.0	29.8	

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PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
III/16/1-5	SD-75	CEOC	hackberry	28-Apr	81	81	PLBR	5	5	100		0.7	1.8	
	9005713		*Celtis occidentalis*			82			4	80		3.6	3.4	
			Potter Co., SD			83			5	100		5.2	4.0	
						84			5	100	4	5.1	6.5	
						85			5	100	5	5.6	7.6	
						87			5	100	3	10.9	12.6	
						90			5	100	4	12.5	15.0	
						95			5	100	2	16.7	24.4	
						00			5	100	3	20.0	27.2	
						05			5	100	2	21.0	35.0	average
III/16/6-10	SD-211	CEOC	hackberry	28-Apr	81	81	PLBR	5	4	80		0.5	0.8	
	9005714		*Celtis occidentalis*			82			5	100		2.6	2.0	
			Sanborn Co., SD			83			5	100		5.1	4.6	
						84			5	100	4	3.7	6.3	Plt 7 broken down
						85			5	100	5	7.4	7.4	
						87			5	100	2	12.7	13.3	
						90			5	100	4	14.7	15.1	
						95			5	100	2	19.5	23.2	
						00			5	100	2	25.9	27.6	
						05			5	100	3	21.0	39.0	average
III/17/1-5	9082675	FRMA	Manchurian ash	2-May	00	00	CONT	5	5	100	7	0.4	1.3	
			Fraxinus mandshurica			01			5	100	7	0.7	1.3	heavily browsed
			Lincoln-Oakes Nursery, Bismarck, ND			02			5	100	5	1.5	2.0	browsed
						04			5	100	5	1.0	2.4	browse
						06			5	100	5	1.2	3.0	dead leaves on 3
						09			5	100	6	0.8	2.7	
III/17/6-10	9082650	POPUL	Soongarica poplar	2-May	00	00	CONT	5	4	80	4	1.1	1.8	
			Populus			01			5	100	6	1.6	2.7	
			Valley Nursery, Helena, MT			02			5	100	5	2.2	3.5	
						04			5	100	6	2.2	3.3	leader deer rubbed on 4
						06			4	80		2.4	2.6	
						09			0	0				

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PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
III/18/1-5	9076723	ULPU	Siberian elm	30-Apr	96	96	PLBR	5	5	100	3	2.3	2.5	deer browse on all
			Ulmus pumila			97			5	100	3	3.6	3.6	deer browse on all
			USSR			98			5	100	5	5.7	5.4	
			USDA, ARS, Mandan, ND			00			2	20	3	17.1	13.5	
						02			2	40	3	24.5	19.0	
						05			2	40	4	25.0	30.5	
III/18/6-10	9063098	JUNI	black walnut	21-May	91	91	PLBR	5	5	100	5	0.9	1.8	
			Juglans nigra			92			5	100	6	0.8	1.8	
			Big Sioux Nursery, Watertown, SD			93			5	100	6	0.9	1.6	
						94			4	80	3	3.3	3.2	
						95			4	80	4	3.0	3.4	
						97			4	80	5	5.5	5.2	poor site
						00			4	80	4	11.1	10.0	
						05			3	60		17.0	30.0	
III/19/6-10	9076724	ELAN	Russian olive	30-Apr	96	96	PLBR	5	5	100	3	4.6	3.8	
			Elaeagnus angustifolia			97			5	100	1	7.6	6.2	
			USSR			98			5	100		10.5	8.7	
						00			5	100	4	14.6	14.3	
						02			4	80	4	18.0	17.0	
						05			4	80	5		18.3	
III/20/6-10	9069166	ELAN	Russian olive	30-Apr	96	96	PLBR	5	5	100	3	1.8	2.6	
			Elaeagnus angustifolia			97			5	100	4	3.4	4.0	very poor site,
			USSR			98			5	100	4	6.7	7.2	mech. damage on 4
			USDA, ARS, Mandan, ND			00			4	80	5	12.7	14.1	
						02			4	80	6	12.8	16.8	
						05			1	20	3	18.0	24.0	
III/21/1-5	9054820	ULPU	Siberian elm	26-Apr	95	95	PLBR	5	5	100	3	1.7	2.2	deer browse on all
			Ulmus pumila			96			5	100	3	3.8	3.8	
			USDA, NRCS, PMC, Bridger, MT			97			5	100	3	5.7	5.7	deer browse on all
						99			5	100	3	9.9	12.3	
						01			5	100	4	13.6	16.0	
						04			5	100	4	16.0	18.8	browse
						09			5	100	4	21.2	22.3	

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III/21/1-10	ND-428	JUNI	black walnut	30-Apr	85	85	PLBR	10	10	100	4	0.5	0.9	
	9005970		*Juglans nigra*			86			5	50		1.2	1.1	
			USDA, NRCS, PMC, Bismarck, ND			87			5	50		0.4	0.9	
						89			4	40	4	2.6	2.1	
						91			4	40	4	4.3	4.1	
						94			3	30	4	8.3	5.8	
						99			2	20		15.6	15.6	
						04			2	20	6	24.0	21.5	
						09			2	20		17.5	21.3	

Below is the 2009 annual progress report, a stand-alone publication, for this study.

2009 Report
Off-Center Evaluation Planting of Woody Plant Materials Morris, Minnesota

Dwight Tober, Plant Materials Specialist
Rachel Bergsagel, Biological Technician
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 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 six locations in the three-state area, including three sites in Minnesota.

A long-term agreement, effective through July 28, 2008, was developed with the University of Minnesota, West Central Research and Outreach Center at Morris, Minnesota. The Major Land Resource Area is 102A, Rolling Till Prairie. Soils are a Barnes-Buse loam complex and long-term average rainfall is 25.39 inches. The site is located about one-half mile east of the livestock buildings. The first trees and shrubs were planted in 1978. The agreement was renewed in 1993 for 15 years. Evaluation of the conifer block was discontinued in 1995 due to poor adaptation to the heavy soils. A major renovation took place in 1997 when dead and poor performing entries were removed to make room for new plant material. The site was maintained with cultivation until 2002 when a 50/50 mix of Bad River blue grama and 'Pierre' sideoats grama was broadcast seeded on the bare ground. New entries planted each year are flagged and mulched with wood chips, and hand watered. Weed control is accomplished by spot spraying with glyphosate and broadleaf herbicides. Spring and early summer rainfall was short. April through July totaled 4.5 inches in 2009 compared to a total of 13 inches for the normal. Fall rains were excessive as close to 7 inches fell in October compared to the monthly normal of 2.3 inches. Measurements and notes are taken annually in August.

OBJECTIVES

1. Assemble and evaluate the adaptation and performance of selected woody plant material 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.

New trees and shrubs planted in the spring are hand watered and mulched with wood chips.

ACTIVITIES IN 2009

Approximately 116 accessions of 54 different species are currently being evaluated. Three new entries and one replacement were planted on May 7, 2009. New entries included American highbush cranberry (*Viburnam opulus* var. *americanum*) from Big Sioux Nursery at Watertown, South Dakota; and two hackberry (*Celtis occidentalis*) accessions, Prairie Harvest, a new PMC release from Polk County, Minnesota; and 'Oahe', a PMC release from central South Dakota. The one replacement was ironwood (*Ostrya virginiana*) from Bismarck, North Dakota. It was potted stock. Entries that were removed because of poor performance included Midwest Premium plum from Missouri; pin cherry 9091967 from Big Sioux Nursery at Watertown, South Dakota; and black chokeberry 9091971 from Bailey Nurseries at Saint Paul, Minnesota. Weed control and maintenance have been consistently good. The short stature blue grama/sideoats grama cover between the tree rows is mowed occasionally during the growing season. 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 by staff at the Research and Outreach Center. Several entries in the plots have been flagged for future removal and include 'Centennial' cotoneaster, 'Scarlet' Mongolian cherry, 'Regal' Russian almond, Silver Sands germplasm sandbar willow, ND-170 cotoneaster, 'Konza' sumac, black locust, and Russian olive. Most of these are scheduled for removal because they are at the end of their productive life span.

Staff at the Morris NRCS field office, and the Research and Outreach Center helped collect data on selected entries on August 20, 2009. 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. The new entries were off to a good start, although the American highbush cranberry had been browsed. Many of the mature entries continued to perform well. There are also some accessions declining in health and overall vigor because of disease and natural die-back as they approach the end of their life span. Many of the newer entries planted in the last several years had slight to severe rabbit and/or deer browse. The fruit species generally sustained the most damage. Forty-four accessions/entries were evaluated in 2009.

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 me at (701) 530-2075 or Dwight.Tober@nd.usda.gov. The report is about 30 pages in length. Mike Knudson compiled a report in

2003 titled *A Quarter Century of Tree Planting Trials at the Morris, Minnesota Field Evaluation Planting* which contains complete data summary information inclusive to all species tested at this site. This 38-page report can also be requested through me or the Bismarck Plant Materials Center, (701) 250-4330.

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 was planted in 1990, and Survivor germplasm false indigo was planted in 1987. They both had 100 percent survival, good to excellent vigor, and good overall plant performance ratings for at least the first 10 years. Both species are subject to natural die-back due to winter or drought conditions. A release brochure for these two new releases was completed in 2006 and is available on the Bismarck PMC

'Silverscape' olive hybrid (background) and Meyer's spruce (foreground) are showing high vigor. Blue grama and sideoats grama have done well as cover plantings between rows.

homepage (http://Plant-Materials.nrcs.usda.gov), or it can be ordered from the Bismarck PMC. 'Prairie Red' hybrid plum was released as a formal cultivar in 2006 with MAES. It is known for a high percentage of large, sweet fruit and is less suckering than the American plum. It was planted at the Morris site in 1985 and removed in 1999. It performed well overall. 'McKenzie' black chokeberry was evaluated from 1989–1997 and performed well also. 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 Morris site and show promise for additional testing and/or promotion for conservation use include the following:

'Cardan' green ash	**'Oahe' hackberry**
9057409 American hazel	**ND-686 Pekin lilac**
9082687 black currant	**9082712 bittersweet**
ND-2103 European cranberry	**9076722 European white birch**
'McDermand' Ussurian pear	**'Freedom' honeysuckle**

'Indigo' silky dogwood	**'Regal' Russian almond**
ND-3744 Korean barberry	**ND-21 nannyberry**
Silver Sands germplasm sandbar willow	**'Scarlet' Mongolian cherry**
SD-156 green ash	**ND-1731 Siberian crabapple**
ND-64 black ash	**'Konza' aromatic sumac**
SD-211 hackberry	**9076719 Scots pine**
'Legacy' late lilac	**'Homestead' Arnold hawthorn**
'Streamco' purpleosier willow	**'Meadowlark' forsythia**
ND-170 cotoneaster	**ND-1753 green ash**
ND-2102 apricot	**9076718 Scots pine**
SD-75 hackberry	**9082631 Japanese birch**
9063148 corktree	**ND-2507 pygmy caragana**
Survivor germplasm false indigo	**'Arnold's Red' honeysuckle**

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 Morris Site

'Cardan' green ash	**1979**
'Oahe' hackberry	**1982**
'Sakakawea' silver buffaloberry	**1984**
'Scarlet' Mongolian cherry	**1984**
'Centennial' cotoneaster	**1987**
'McDermand' Ussurian pear	**1990**
'Homestead' Arnold hawthorn	**1993**
'CanAm' hybrid poplar	**1995**
'Regal' Russian almond	**1997**
'Legacy' late lilac	**1999**
Silver Sands germplasm sandbar willow	**2005**
Survivor germplasm false indigo	**2005**
'Prairie Red' hybrid plum	**2006**
'McKenzie' black chokeberry	**2008**

ACKNOWLEDGMENTS

This research is sponsored and supported by the University of Minnesota, West Central Research and Outreach Center at Morris; the NRCS field office and Stevens County SWCD at Morris; the NRCS area office at Fergus Falls; and the NRCS State office at St. Paul. Appreciation goes to the permanent and seasonal field staff at the Research and Outreach Center for the special attention given to maintenance of the test plots.

OFF-CENTER EVALUATIONS: TECHNICAL REPORT – 2009

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.

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 2009 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 1998 to 2009. 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 1998 to 2009.

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:

Accession Number	Genus/Species Origin/Source	Plot Location
ND-2103 PI-399414	European cranberrybush *Viburnum opulus* P.I. Station, Ames, IA USDA, NRCS, PMC, Bismarck, ND	II/07/1-5
'McKenzie' PI-323957	black chokeberry *Photinia melanocarpa* P. I. Station, Ames, IA USDA, NRCS, PMC, Bismarck, ND	II/06/11-20
ND-21 9034900	nannyberry *Viburnum lentago* USDA, NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	III/05/1-9

Accession Number	Genus/Species Origin/Source	Plot Location
ND-428 9005970	black walnut *Juglans nigra* NDSU/USDA, NRCS, PMC, Bismarck, ND	IV/5/6-10
9063158	Scots pine *Pinus sylvestris* var. *mongolica* China NRCS, PMC, Bismarck, ND	I/5/1-5
9063126	Japanese elm *Ulmus japonica* PFRA, Indianhead, Saskatchewan, Canada NRCS, PMC, Bismarck, ND	IV/3/1-5
ND-3791 9030302	Norway spruce *Picea abies* U of MN, St. Paul, MN Grand Rapids, MN FEP	I/6/6-10
9063151	Dahurian larch *Larix olgensis* China NRCS, PMC, Bismarck, ND	II/6/1-5
9069170	English oak *Quercus robur* Russia USDA, ARS, Mandan, ND	IV/3/6-10
9058847	black spruce *Picea mariana* U of MN, Cloquet, MN Grand Rapids, MN OCEP	I/4/1-8
9063156	Scots pine *Pinus sylvestris* Russia, Altai region USDA, NRCS, PMC, Bismarck, ND	1/5/6-10
9069164	Scots pine *Pinus sylvestris* var. *mongolica* China USDA, NRCS, PMC, Bismarck, ND	1/7/6-10
9063143	red tatarian honeysuckle *Lonicera tatarica* Grand Rapids, MN OCEP	II/6/1-10

Accession Number	Genus/Species Origin/Source	Plot Location
9006094	wafer ash *Ptelea trifoliata* Lincoln-Oakes Nursery, Bismarck, ND	II/7/6-10
9063115	green ash *Fraxinus pennsylvanica* Itasca State Park, MN USDA, NRCS, PMC, Bismarck, ND	IV/2/6-10

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 hnysuckle|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 sea buckthorn	
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

Table No. GR-1: 2009 Weather Summary - Official Station - Grand Rapids, Minnesota					
	Mean Temperature (degrees Fahrenheit)		Precipitation (inches) Actual		Deviation from Normal
Month	**2009**	**Normal***	**2009**	**Normal***	**2009**
January	2.6	6.4	0.70	1.01	-0.31
February	15.4	14.0	0.99	0.61	0.38
March	26.1	26.4	4.24	1.25	2.99
April	42.4	41.1	1.41	1.84	-0.43
May	51.4	54.3	1.80	2.90	-1.10
June	61.3	62.9	3.24	4.60	-1.36
July	62.6	67.4	5.60	4.60	1.00
August	63.1	65.0	2.75	3.70	-0.95
September	62.6	54.9	0.59	3.08	-2.49
October	38.7	43.7	4.15	2.74	1.41
November	36.9	26.9	1.20	1.59	-0.39
December	11.7	12.1	1.25	0.86	0.39
Annual	**39.6**	**39.6**	**27.92**	**28.78**	**-0.86**
*National Climate Data Center 1971-2000 Monthly Normals					
		2009			
Last Frost (28 degrees)		28-Apr			
First Frost (28 degrees)		9-Oct			
Frost Free Period		163 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: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
I/1/6-10	9076718	PISYM	Scots pine	25-May	99	99	CONT	5	5	100	2	0.8	1.0	healthy plants, good bud set
			Pinus sylvestris var. *mongolica*			00			5	100	2	1.4	1.9	
			China			01			5	100	2	2.7	3.5	
			USDA, NRCS, PMC, Bismarck, ND			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	30-Apr	98	98	CONT(S)	5	5	100	3	0.4	1.0	
			Larix sibirica			99			4	80	4	0.8	1.4	needle tips brown
			NDFS, Towner, ND			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	30-Apr	98	98	CONT(P)	5	0	0				
			Larix sibirica			99			4	80	6	1.0	1.8	
			Russia			00			4	80	2	1.0	2.5	
			USDA, NRCS, PMC, Bismarck, ND			04			4	80	4	4.6	8.6	
						07			4	80	3	9.1	17.3	
I/3/6-9	9082610	LASI	Siberian larch	30-Apr	98	98	CONT(S)	4	4	100	3	0.6	1.4	
			Larix sibirica			99			4	100	4	1.2	1.8	
			NDFS, Towner, ND			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	29-May	96	96	tree	8	8	100	4	3.1	5.8	
			Picea mariana			97	spade by		8	100	2	3.5	6.6	light seed production on all
			U of MN, Cloquet, MN			98	IRRRB		8	100	2	4.1	7.3	light cone production
			Grand Rapids, MN FEP			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: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
I/5/1-5	9063158	PISYM	Scots pine	15-May	96	96	CONT(S)	5	5	100	3	0.6	0.8	
			Pinus sylvestris var. *mongolica*			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	
I/5/6-10	9063156	PISY	Scots pine	15-May	96	96	CONT(S)	5	5	100	3	0.7	0.8	
			Pinus sylvestris			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
I/6/1-5	9063151	LAOL	Dahurian larch	15-May	96	96	PLBR	5	5	100	4	0.7	1.6	
			Larix olgensis			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	
I/6/6-10	ND-3791	PIAB	Norway spruce	29-May	96	96	tree	5	5	100	3	5.0	7.7	
	9030302		*Picea abies*			97	spade by		5	100	2	5.5	8.6	
			U of MN, St. Paul, MN			98	IRRRB		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	
I/7/1-5	9069172	PISY	Scots pine	15-May	97	97	CONT(P)	5	5	100	3	0.5	0.6	
			Pinus sylvestris			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	

Project No.: 38I346K Field Evaluation of Woody Plant Materials, Grand Rapids, Minnesota
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PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
I/7/6-10	9069164	PISY	Scots pine	30-Apr	98	98	CONT(P)	5	5	100	3	0.6	1.1	
			Pinus sylvestris var. *mongolica*			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	
			Larix olgensis			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	
			Larix olgensis			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	
			Juniperus communis			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	
1/9/6-10	9082609	PICEA	Meyer spruce	18-May	01	01		5	5	100	3	0.9	0.9	
			Picea meyeri			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	

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PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
II/1/1-5	'Arnolds Red'	LOTA	red tatarian honeysuckle	15-May	96	96	CONT(P)	5	2	40	3	1.4	1.9	
	9069080		*Lonicera tatarica*			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	
II/1/6-20	'Regal'	PRTE	Russian almond	15-May	96	96	PLBR	15	15	100	4	0.7	1.7	
	9006079		*Prunus tenella*			97			15	100	4	0.9	1.5	pear slug on 7,12,14
	PI-540042		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	
II/2/1-10	'Centennial'	COIN16	European cotoneaster	15-May	96	96	PLBR	10	9	90	4	1.0	1.9	leaf wilt and spotty on 6
	PI-113095		*Cotoneaster integerrimus*			97			6	60	4	2.0	2.3	pear slug on all
	9005729		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
II/2/11-20	'Indigo'	COAM2	silky dogwood	15-May	96	96	PLBR	10	6	60	3	1.4	1.9	
			Cornus amomum			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
II/3/1-10	'Legacy'	SYVI3	late lilac	15-May	96	96	PLBR	10	10	100	4	0.6	1.4	
	ND-83		*Syringa villosa*			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

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II/3/11-20	Survivor Germplasm	AMFR	false indigo	15-May	96	96	PLBR	10	10	100	3	1.5	2.6	3,4 chlorotic
	9008041		*Amorpha fruticosa*			97			10	100	3	2.6	2.6	
			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
II/4/1-5	9082685	RORU2	redleaf rose	18-May	01	01	PLBR	5	5	100	5	0.9	1.7	
			Rosa rubrifolia			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	
II/4/6-10	9057406	RORU	rugosa rose	18-May	01	01	PLBR	5	5	100	6	1.0	1.0	
			Rosa rugosa			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	
II/4/11-20	9076734	HIRH80	seaberry	15-May	96	96	PLBR	10	10	100	4	0.6	1.1	
			Hippophae rhamnoides			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
II/5/1-10	Silver Sands Germplasm	SAIN3	sandbar willow	15-May	96	96	CONT(S)	10	9	90	3	3.1	3.5	
	ND-3902		*Salix interior*			97			10	100	1	5.2	4.5	leaf rust all, no suckering yet
	9035212		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

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II/5/11-20	9019576	AMAL2	juneberry	15-May	96	96	PLBR	10	9	90	3	1.0	1.2	
			Amelanchier alnifolia			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%
II/6/1-10	9063143	LOTA	red tatarian honeysuckle	29-May	96	96	hand	10	10	100	5	1.5	2.0	
			Lonicera tatarica			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
II/6/11-20	'McKenzie'	PHME13	black chokeberry	29-May	96	96	tree	9	9	90	3	1.9	1.8	
	PI-323957		*Photinia melanocarpa*			97	spade		9	90	3	2.1	2.1	pear slug on 5-9
			PI Station, Ames, IA			98	by IRRRB		10	100	2	2.6	2.4	
			old FEP site, Grand Rapids, MN			00			9	90	2	4.1	3.7	
						02			8	95	1	7.2	4.5	excellent vigor
						05			8	95	3	7.3	6.7	
II/7/1-5	ND-2103	VIOP	European cranberrybush	29-May	96	96	tree	10	5	100	3	3.6	2.7	
			Viburnum opulus			97	spade		5	100	3	4.2	3.9	leaf spot on 3,4
			P.I. Station, Ames, IA			98	by IRRRB		5	100	1	2.4	2.4	leaf spot on all
			old FEP site, Grand Rapids, MN			00			5	100	2	5.9	6.0	
						02			5	100	5	5.8	6.2	2 dieback
						05			4	80	4	5.7	6.2	
II/7/11-20	10 new	CORYL	hazel hybrids	29-May	96	96	CONT	10	10	100	4	0.3	0.4	leaf damage on 6,7,8
	accessions		*Corylus*			97			10	100	4	0.7	1.2	
			Badgersett Research Farm, Canton, MN			98			10	100	4	1.8	2.1	
						00			10	100	3	4.0	4.2	
						02			10	100	4	5.6	5.1	variable heights
						05			10	100	5	5.8	6.7	

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II/7/21-25	9091971	PHME13	black chokeberry	24-May	05	05		5						data missing
			Photinia melanocarpa			06			5	100	3	1.9	2.6	
			Bailey Nurseries, St. Paul, MN			07			5	100	3	1.8	2.5	
						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	
			Viburnum opulus var. *americanum*			07			4	80	6	0.4	0.8	
			Bottineau Co., ND			08			5	100	6	0.3	1.0	
			USDA, NRCS, PMC, Bismarck, ND											
II/8/6-10	9069052	SALIX	silky willow	15-May	06	06		5	4	80	4	1.0	1.5	
	Riverbend germplasm		*Salix*			07			4	80	5	0.6	1.4	
			USDA, NRCS, PMC, East Lansing, MI			08			4	80	6	0.8	1.7	
II/8/11-15	9082664	COAL	Siberian dogwood	10-May	00	00	PLBR	5	5	100	3	0.7	2.5	
			Cornus alba 'sibirica'			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	
ll/8/16-20	9082738	CORA6	gray dogwood			03	PLBR	5	5	100	3	1.1	1.8	
			Cornus racemosa			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	
			Viburnum lentago			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	winterberrry euonymus		02	02	PBLR	5	5	100	4	1.0	2.6	
			Euonymus bungeanus			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	

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II/9/6-10	9082712	CESC	bittersweet		02	02	PLBR	5	5	100	2	1.0	1.4	
			Celastrus scandens			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
II/9/11-15	9082678	AMCA6	leadplant		02	02	PLBR	5	5	100	6	0.7	0.8	
			Amorpha canescens			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	
			Cornus racemosa			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
II/9/21-25	'Freedom'	LOKO	honeysuckle		03	03	PLBR	5	4	80	3	2.2	2.5	
			Lonicera korolkowii			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	
			Crataegus chrysocarpa			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	
II/9/31-35	9082891	PHOP	common ninebark	25-May	04	04	PLBR	4	4	100		0.7	1.9	
			Physocarpus opulifolius			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	

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III/1/1-5	'Homestead'	CRAN6	arnold hawthorn	15-May	96	96	PLBR	5	5	100	3	1.0	1.6	
	PI-503530		*Crataegus X anomala*			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	
III/1/6-10	9082739	OSVI	ironwood	May	07	07		5	5	100	3	0.4	1.3	3,5 browsed
			Ostrya virginiana			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'	PYUS2	Ussurian pear	15-May	96	96	PLBR	5	5	100	3	1.2	2.4	leaf miner on 5
	PI-478004		*Pyrus ussuriensis*			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	
III/2/6-10	'Magenta'	MABA	hybrid crabapple	15-May	96	96	PLBR	5	5	100	4	0.9	1.9	
			Malus 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
III/3/1-5	'Midwest'	MAMA37	Manchurian crabapple	15-May	96	96	PLBR	5	5	100	4	1.4	2.3	
	PI-478000		*Malus mandshurica*			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	

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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
			Prunus maackii			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
III/4/1-5	9076722	BEPE3	European white birch	15-May	96	96	PLBR	5	5	100	4	2.5	3.6	leaf miner on 3
			Betula pendula			97			5	100	3	4.0	5.0	
			USDA, ARS, Mandan, ND			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
III/4/6-10	9047209	PRVI	chokecherry	15-May	96	96	PLBR	5	5	100	5	0.9	1.9	
			Prunus virginiana			97			5	100	3	1.5	2.4	shot hole on 1
			Lincoln-Oakes Nursery, Bismarck, ND			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
III/5/1-9	ND-21	VILE	nannyberry	29-May	96	96	tree	9	9	100	4	3.0	5.3	leaf rust on 2
	9034900		*Viburnum lentago*			97	spade by		9	100	4	3.4	5.2	mod-severe leaf rust on all
			USDA, NRCS, PMC, Bismarck, ND			98	IRRRB		9	100	3	3.6	5.2	
			Grand Rapids, MN FEP			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
III/6/1-5	9076737	PRSE2	black cherry	15-May	97	97	PLBR	5	5	100	3	0.9	1.5	
			Prunus serotina			98			5	100	4	2.7	3.5	
			Apple Valley FEP			99			5	100	4	3.9	4.8	leaf spot
			Lincoln-Oakes Nursery, Bismarck, ND			01			5	100	4	6.4	7.5	
						03			5	100	3	8.0	11.3	
						07			5	100	3	12.7	15.8	

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III/6/6-10	9091975	AMELA	serviceberry	24-May	05	05		5	5	100	3	0.9	2.3	1 browsed
			Amelanchier lamarckii			06			5	100	4	10.5	14.4	
			Lincoln-Oakes Nursery, Bismarck, ND			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
III/6/11-15	9008183	PRVI	common chokecherry	24-May	05	05		5	5	100	3	1.0	2.5	
			Prunus virginiana			06			5	100	3	1.0	2.8	
			Lincoln-Oakes Nursery,Bismarck, ND			07			5	100	4	1.2	4.1	black knot on 2,4
						09			5	100	4	3.3	5.9	
III/7/1-5	9082631	BEPLJ	Japanese birch	25-May	99	99	PLBR	5	4	80	2	1.1	3.0	
			Betula platyphylla var. *japonica*			00			5	100	3	3.2	5.0	
			USDA, NRCS, PMC, Bismarck, ND			01			5	100	2	6.5	8.0	
						03			3	100	3	10.6	17.2	
						05			5	100	1	12.2	19.2	no disease on 1
						08			0	0				all diseased, to be removed
III/7/6-10	9006094	PTTR	wafer ash	25-May	99	99	PLBR	5	5	100	2	1.1	2.0	very healthy, glossy leaves
	ND-624		*Ptelea trifoliata*			00			5	100	2	1.9	2.5	
			Lincoln-Oakes Nursery, Bismarck, ND			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	7-May	08	08		5	5	100	3	0.4	1.2	
			Rhus trilobata			09			5	100	7	0.9	1.0	
			Cave Hills, SD											
			USDA, NRCS, PMC, Bismarck, ND											

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IV/1/1-5	'Oahe'	CEOC	hackberry	15-May	96	96	PLBR	5	5	100	4	1.1	2.4	
	PI-476982		*Celtis occidentalis*			97			5	100	3	1.6	2.4	
			NRCS, PMC, Bismarck, ND			98			5	100	4	3.1	3.9	
			Lincoln-Oakes Nursery, Bismarck, ND			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
IV/1/6-10	'Cardan'	FRPE	green ash	15-May	96	96	PLBR	5	5	100	3	1.1	2.1	
			Fraxinus pennsylvanica			97			5	100	2	1.9	3.4	
			NRCS, PMC, Bismarck, ND			98			5	100	4	3.9	5.3	
			Lincoln-Oakes Nursery, Bismarck, ND			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	
IV/1/11/15	9082892	POAL7	white poplar	25-May	04	04	PLBR	5	5	100	5	0.6	1.9	
			Populus alba			05			5	100	4	2.1	4.2	
			Big Sioux Nursery, Watertown, SD			06			5	100	5	4.8	7.4	
						08			5	100	5	9.0	12.5	
IV/2/1-5	9069177	QUMA2	bur oak	30-Apr	98	98	CONT(P)	5	5	100	6	0.6	0.8	
			Quercus macrocarpa			99			4	80	6	1.5	2.0	
			E.T. Jacobson, MN			00			5	100	5	1.9	2.5	
			USDA, NRCS, PMC, Bismarck, ND			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	15-May	96	96	CONT(P)	5	5	100	5	0.7	1.4	
			Fraxinus pennsylvanica			97			5	100	3	0.9	2.3	
			Itasca State Park, MN			98			5	100	4	3.4	4.3	
			USDA, NRCS, PMC, Bismarck, ND			00			5	100	2	7.1	10.9	
						02			5	100	2	11.7	15.8	
						05			5	100	2	12.4	22.5	

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IV/2/11-15	9082650	POPUL	Soongarica poplar	10-May	00	00	CONT	5	5	100	3	1.4	3.5	
			Populus			01			5	100	3	5.2	7.8	5 blew over, roots curled
			Valley Nursery, Helena, MT			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	15-May	96	96	CONT(P)	5	5	100	3	3.0	3.0	
			Ulmus japonica			97			5	100	2	4.7	4.5	
			PFRA, Indianhead, Saskatchewan, Canada			98			5	100	2	7.7	6.3	
			USDA, NRCS, PMC, Bismarck, ND			00			5	100	2	12.5	11.8	
						02			5	100	2	15.5	14.5	
						05			5	100	2	20.0	20.1	
IV/3/6-10	9069170	QURO2	English oak	15-May	96	96	PLBR	5	5	100	4	0.7	0.9	
			Quercus robur			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	
IV/3/11-15	9082675	FRMA5	Manchurian ash	10-May	00	00	PLBR	5	5	100		0.7	2.1	
			Fraxinus mandshurica			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	
			Juglans cinerea			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	

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IV/4/6-10	9076743	CADE12	chestnut	29-May	96	96	CONT	5	2	40	3	1.0	1.5	
			Castanea dentata			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
IV/4/11-15	9082667	BEPO	gray birch	10-May	00	00		5	5	100	4	1.2	3.2	
			Betula populifera			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	
IV/5/1-5	9057412	QUMA2	bur oak	29-May	96	96	tree	4	4	100	4	2.0	2.5	
			Quercus macrocarpa			97	spade by		4	100	3	2.4	3.3	
			Foster Co., ND			98	IRRRB		4	100	3	5.2	5.3	
			USDA, NRCS, PMC, Bismarck, ND			00			4	100	3	8.0	7.9	
						02			4	100	3	9.6	10.2	
						05			4	100	4	10.2	13.6	
IV/5/6-10	9005970	JUNI	black walnut	29-May	96	96	tree	5	5	100	5	2.8	2.9	
			Juglans nigra			97	spade by		5	100	2	1.7	2.6	
			NDSU			98	IRRRB		5	100	3	5.3	4.4	
			USDA, NRCS, PMC, Bismarck, ND			00			5	100	3	7.3	6.6	
						02			5	100	3	8.6	8.8	
						05			5	100	4	8.2	12.3	
IV/5/11-15	9082674	ACSA3	sugar maple	10-May	00	00	PLBR	5	5	100	3	1.0	1.8	
			Acer saccharum			01			2	40	5	1.5	1.8	
			Polk Co., MN			02			5	100	6	1.4	2.0	
			Lincoln-Oakes Nursery, Bismarck, ND			04			4	80	4	1.8	4.3	
						06			3	60	5	3.4	7.2	
						09			4	80	5	5.8	10.5	

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IV/6/1-5	9091967	PRPE	pin cherry	7-May	08	08		5	5	100	3	0.7	2.3	
			Prunus pennsylvanica			09			5	100	5	1.0	2.3	all browsed
			Big Sioux Nursery, Watertown, SD											
IV/6/5-10	9082633	FRNI	black ash	25-May	99	99	PLBR	5	5	100	6	0.5	1.0	
			Fraxinus nigra			00			5	100	5	0.8	1.3	
			Lawyer Nursery, Plains, MT			01			4	80	4	1.4	2.0	
						03			4	80	3	2.3	3.1	
						05			4	80		3.3	5.8	
						08			4	80		5.8	11.4	
IV/6/11-15	9092052	QUBI	swamp white oak	15-May	06	06	PLBR	5	5	100	3	0.8	1.4	
			Quercus bicolor			07			4	80	5	0.5	1.1	
			Lincoln-Oakes Nursery, Bismarck, ND			08			3	60	5	0.7	1.3	
IV/7/6-10	9092051	CASP8	northern catalpa	15-May	06	06	PLBR	5	5	100		0.6	0.8	
			Catalpa speciosa			07			5	100	6	0.3	0.7	
			Big Sioux Nursery, Watertown, SD			08			5	100	5	0.4	0.8	

Below is the 2009 annual progress report, a stand-alone publication, for this study.

2009 Report
Off-Center Evaluation Planting of Woody Plant Materials Grand Rapids, Minnesota

Dwight Tober, Plant Materials Specialist
Rachel Bergsagel, Biological Technician
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 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 six 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 was over 3 inches in March compared to the long-term normal of 1.25 inches. April was close to average, but May through September was considerably less than normal. The plants overall 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 2009

Approximately 75 accessions of 50 different species are currently being evaluated. No new entries were planted in 2009. Several potted replacements were planted for non-surviving entries planted last year. The site was reviewed and replacements planted on May 6, 2009. 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 will be contracted out this year, and will probably be limited to several mowings. The agreement with the North Central Research Center expires in 2011.

NRCS field office staff helped collect data on selected entries on August 18, 2009. 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. The Meyer spruce are looking better and starting to put on some growth. Newer shrub entries that continue to do well include common juniper, black chokeberry from Bailey Nurseries, bittersweet, common ninebark, leadplant, nannyberry, winterberry euonymus, bittersweet, and 'Freedom' honeysuckle. Many of the older tree entries continue to perform well (see list page 4).

Special items on the maintenance list include radical removal of remaining clump white birch; chemical treatment of birch resprouts in new ironwood planting; and removal or cutting back of Russian almond. 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 me at (701) 530-2075, or the NRCS field office at Grand Rapids, (218) 326-6596. The report is about 20 pages in length.

Meyer's spruce had slow growth initially, but has grown one foot in each of the last two years. It was planted in 2001.

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 both had good survival and excellent vigor and overall plant performance. Both species are subject to natural die-back, but generally re-sprout vigorously. 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.

'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.

'Indigo' silky dogwood has performed well. It was planted in 1996 and is now over 12 feet tall and 15 feet wide.

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**
'McDermand' 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**

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 Saint Paul. Appreciation goes to staff at the NRCS and SWCD field office, and the Research and Outreach Center for the special attention given to care and maintenance of the test plots.

OFF-CENTER EVALUATION PLANTINGS: TECHNICAL REPORT – 2009

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 expires August 9, 2010.

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 2009 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 2009.

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 2009.

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 eight accessions of 85 species are being evaluated. Maintenance on this site is excellent. The following accessions exhibit potential for further evaluation and use.

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

Figure BE-1. Sand Plain Experimental Farm plot layout

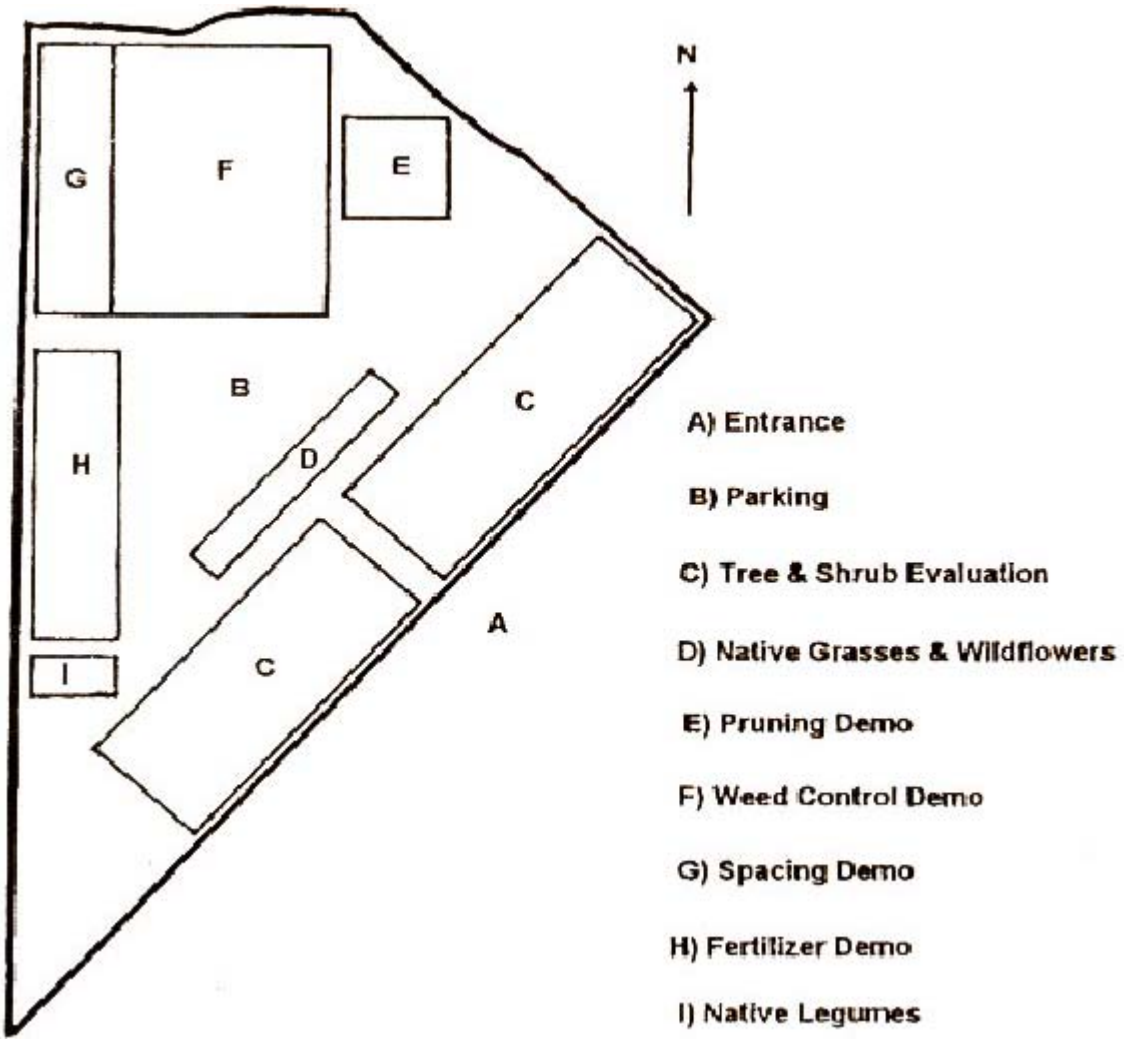

Figure BE-2. Becker Woody Off Center Evaluation Planting – Plot Layout

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	9082886 aspen (LON)	Scotch pine		
11	ND-686 Pekin lilac			
10	9082885 aspen (Towner)	9082633 black ash		
9	9082609 Meyer's spruce	9092236 aspen		
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	**BLOCK 1A SHRUBS**	
Row	**BLOCK I SHRUBS**		apricot|Caragana frutex|skunkbush sumac|pin cherry	
10	ND-83 late lilac	9019621 lilac	TigerEyes sumac | nannyberry | MO hazelnut | MO plum	
9	Scarlet Mongolian cherry	9019579 Sib. pea shrub	com. ninebark|Am. hazelnut|ND-1134 plum|staghorn sumac	
8	Konza aromatic sumac	Regal Russian almond	mugo pine|seaberry|wayfaring bush|roundleaf hawthorn	
7	9019576 juneberry	Shadblow svcbry|arrowwood	pr. rose|M. gooseberry	pin cherry|b.l. honeysuckle
6	9019581 Pekin cotoneaster	9019605 sand cherry	leadplant|chokeberry	chokecherry|Red River pr.cordgr.
5	Centennial E. cotoneaster	ND-170 Euro. cotoneaster	Nero chokbry|Viking ch.	winterberry E.| bittersweet
4	A Amber sk.sumac|Am.h.cranberry		redleaf rose|rugosa rose	black currant|cupplant
3	9076729 gray dogwood		chokeberry|Sib.dogwood	slough sedge | sweetgrass
2	9019580 redosier dogwood	Indigo silky dogwood	9008041 false indigo	9082632 Mong. pea shrub
1	Arnolds Red honeysuckle	9063143 r.t. honeysuckle	9019611 golden currant	ND-3902 sandbar willow

revised 6/09

Table No. BE-1: 2009 Weather Summary - Official Station - Elk River, Minnesota

	Mean Temperature (degrees Fahrenheit)		Precipitation (inches) Actual		Deviation from Normal
Month	**2009**	**Normal****	**2009**	**Normal***	**2009**
January	4.4	11.1	0.45M	0.86	M
February	18.1	18.6	1.09M	0.69	M
March	27.6	30.5	1.79M	1.75	M
April	45.6	45.6	1.36M	2.49	M
May	57.5	58.7	0.53M	3.45	M
June	66.4	66.7	3.47M	4.51	M
July	68.19M	71.1	3.78M	4.22	M
August	68.04M	68.7	5.80M	4.26	M
September	65.5	59.5	1.06M	3.14	M
October	42.0	47.8	5.03M	2.21	M
November	40.3	30.9	0.67M	1.89	M
December	16.5	16.8	2.07M	0.83	M
Annual	**43.3M**	**43.8**	**27.10M**	**30.30**	**M**

*National Climate Data Center 1971-2000 Monthly Normals

**Mean Temperature normal is not available for Elk River, nearby Santiago normal is shown

M = missing data

***First and last frost dates from Buffalo, MN (Elk River dates unavailable)

	2009***
Last Frost (28 degrees)	11-Apr
First Frost (28 degrees)	10-Oct
Frost Free Period	181 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.: 38I347K Field Evaluation of Woody Plant Materials, Becker, Minnesota
Year of Record: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
I/1/1-10	'Arnolds Red'	LOTA	red tatarian honeysuckle	1-May	96	96	CONT(P)	10	10	100	4	2.0	2.1	
	9069080		*Lonicera tatarica*			97			10	100	5	1.8	2.1	
			Lee Nursery, Fertile, MN			98			10	100	2	2.6	4.1	
			USDA, NRCS, PMC, Bismarck, ND			00			10	100	4	4.4	5.3	
						02			10	100	3	4.8	6.1	All fair fruit; yellow leaf tips
						05			10	100	4	5.0	7.3	
I/1/11-20	'Hawkeye'	LOTA	red tatarian honeysuckle	1-May	96	96	CONT(P)	10	10	100	3	1.7	1.9	
	9063143		*Lonicera tatarica*			97			10	100	4	1.5	2.4	
			Iowa			98			10	100	2	2.2	3.0	
			Lincoln-Oakes Nursery, Bismarck, ND			00			10	100	2	5.1	5.2	
			USDA, NRCS, PMC, Bismarck, ND			02			10	100	2	5.8	6.5	
						05			10	100	3	6.7	7.7	good vigor
I/2/1-10	9019580	COST	redosier dogwood	1-May	96	96	PLBR	10	10	100	3	1.2	2.5	browse on 3,4
			Cornus stolonifera			97			9	90	2	2.6	3.0	
			Lincoln-Oakes Nursery, Bismarck, ND			98			9	90	2	5.1	4.0	
						00			9	90		8.4	5.8	
						02			10	100	1	7.7	5.6	some leaf rust throughout all
						05			9	90	3	9.0	6.9	
I/2/11-20	'Indigo'	COAM	silky dogwood	1-May	96	96	PLBR	10	10	100	4	1.7	2.1	
	468117		*Cornus amomum*			97			9	90	2	3.2	2.9	
			USDA, NRCS, PMC, E. Lansing, MI			98			9	90	1	7.2	4.8	
						00			9	90	2	9.6	6.4	
						02			9	90	3	9.8	7.3	
						05			10	100	5	10.5	7.3	dieback on 1,2; resprout on 4
I/3/1-10	9076729	CORA	gray dogwood	1-May	96	96	PLBR	10	10	100	3	1.4	1.9	browse on 2,3
			Cornus racemosa			97			10	100	3	2.2	2.8	
			Lincoln-Oakes Nursery, Bismarck, ND			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	

Project No.: 38I347K Field Evaluation of Woody Plant Materials, Becker, Minnesota
Year of Record: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
1/4/11-15	'Autumn Amber'	RHTR	skunkbush sumac *Rhus trilobata* USDA, NRCS, PMC, Los Lunas, NM	7-May	09	09		5	5	100	3	1.1	0.7	
1/4/16-20	9094281	VIOPA	American highbush cranberry *Viburnum opulus* var. *americanum* Big Sioux Nursery, Watertown, SD	7-May	09	09		5	5	100	3	1.4	1.6	
I/5/1-10	'Centennial'	COIN16	European cotoneaster	1-May	96	96	PLBR	10	10	100	5	1.6	1.6	browse on 7
	113095		*Cotoneaster integerrimus*			97			9	90	4	1.6	1.6	some dieback on 2,7
	9005729		USDA, NRCS, PMC, Bismarck, ND			98			9	90	4	4.0	3.9	
			Lincoln-Oakes Nursery, Bismarck, ND			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
I/5/11-20	ND-170	COIN16	European cotoneaster	1-May	96	96	PLBR	10	10	100	3	1.8	2.0	
	9005728		*Cotoneaster integerrimus*			97			10	100	5	2.1	2.0	leaf spots
			USDA, NRCS, PMC, Bismarck, ND			98			10	100	4	3.7	2.9	
			Lincoln-Oakes Nursery, Bismarck, ND			00			10	100	2	7.3	4.1	
						02			10	100	2	7.2	4.5	
						05			10	100	3	6.3	4.5	
I/6/1-10	9019581	COAC	Pekin cotoneaster	1-May	96	96	PLBR	10	10	100	5	1.0	1.6	
			Cotoneaster acutifolia			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
I/6/11-20	9019605	PRBE	sand cherry	1-May	96	96	PLBR	10	10	100	3	1.8	2.4	
			Prunus besseyi			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

Project No.: 38I347K Field Evaluation of Woody Plant Materials, Becker, Minnesota
Year of Record: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
I/7/1-10	9019576	AMAL	juneberry	1-May	96	96	PLBR	10	10	100	5	1.0	1.0	
			Amelanchier alnifolia			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
1/7/6-10	9091975	AMELA	serviceberry	12-May	05	05		5	5	100	6	0.6	1.2	1,4 browsed
			Amelanchier lamarckii			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	05		5	5	100	6	0.6	1.7	dead leaves on 1,4
			Viburnum dentatum			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	
I/8/1-10	'Konza'	RHAR	aromatic sumac	1-May	96	96	PLBR	10	7	70	6	0.7	1.1	
	477981		*Rhus aromatica*			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	
I/8/11-20	'Regal'	PRTE	Russian almond	1-May	96	96	PLBR	10	10	100	5	0.7	1.7	
	540442		*Prunus tenella*			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
I/9/1-10	'Scarlet'	PRFR	Mongolian cherry	1-May	96	96	PLBR	10	10	100	3	1.1	1.3	
	478003		*Prunus fruticosa*			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

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I/9/11-20	9019579	CAAR	Siberian pea shrub	1-May	96	96	PLBR	10	10	100	5	0.8	2.0	browse on all
			Caragana arborescens			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
I/10/1-10	'Legacy'	SYVI	late (villosa) lilac	1-May	96	96	PLBR	10	10	100	6	0.6	1.1	resprout on 7,9
	ND-83		*Syringa villosa*			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
I/10/11-20	9019621	SYVU	common lilac	1-May	96	96	PLBR	10	10	100	5	1.0	1.6	better than late lilac
			Syringa vulgaris			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
IA/1/1-10	9019611	RIAU	golden currant	1-May	96	96	PLBR	10	10	100	4	1.2	2.1	
			Ribes aureum			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
IA/1/11-20	Silver Sands	SAIN	sandbar willow	1-May	96	96	CONT(S)	10	0	0				
	Germplasm		*Salix interior*			97			3	30	5	1.1	2.0	
	ND-3902		USDA, NRCS, PMC, Bismarck, ND			98			8	80	6	0.8	1.3	rabbit browse on all
	9035212					00			10	100	2	8.4	5.2	
						02			10	100	2	9.1	6.4	
						05			10	100	2	9.0	7.5	

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IA/2/1-10	Survivor Germplasm	AMFR	false indigo	1-May	96	96	PLBR	10	10	100	3	2.3	2.7	browse on all
	9008041		*Amorpha fruticosa*			97			10	100	4	3.0	2.2	
			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	
1A/2/11-20	9082632	CAIN	Mongolian peashrub	29-Apr	99	99	PLBR	10	10	100	3	0.8	1.0	
			Caragana intermedia			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	323957	PHME13	black chokeberry	3-May	00	00	PLBR	5	5	100	2	1.6	1.7	
			Photinia melanocarpa			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	COAL	Siberian dogwood	5-May	00	00	PLBR	5	5	100	2	1.5	2.7	
			Cornus alba 'sibirica'			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	01	PLBR	5	5	100	3	1.8	1.7	
			Rosa rubrifolia			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	

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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	
			Rosa rugosa			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	
1A/4/11-15	9082687	RIAM2	black currant	16-May	01	01	PLBR	5	5	100		1.5	1.9	
			Ribes americanum			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	
1A/4/16-20	9082714	SIPEP	cupplant		02	02	CONT	5	5	100	3	0.6	0.3	
			Silphium perfoliatum			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'	PHME13	chokeberry		02	02	PLBR	5	5	100	3	1.0	1.5	
	9082719		*Photinia melanocarpa*			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'	PHME13	chokeberry		02	02	PLBR	5	5	100	3	1.1	1.4	
	9082720		*Photinia melanocarpa*			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	
			Euonymus bungeanus			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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1A/5/16/20	9082712	CESC	bittersweet		02	02	PLBR	5	5	100	3	0.5	1.0	
			Celastrus scandens			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	
			Amorpha canescens			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	
			Photinia melanocarpa			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	
			Prunus virginiana			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
						09			5	100	4	4.5	5.5	tent caterpillars on 1
1A/7/1-5	9082706	ROAR	prairie rose		03	03		5	5	100	4	1.2	1.2	
			Rosa arkansana			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	
			Ribes missouriensis			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	
			Prunus pensylvanica			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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1A/7/16-20	'Freedom'	LOKO	blueleaf honeysuckle		03	03	PLBR	5	5	100	4	2.2	2.2	
			Loniceral korolkowii			04			5	100	3	4.7	4.0	
			Lincoln-Oakes Nursery, Bismarck, ND			05			5	100	2	5.5	4.9	clean leaves, no disease
						09			5	100	2	9.3	8.1	
1A/8/1-5	9082889	PIMU80	Mugo pine	12-May	04	04	PLBR	5	5					no measurements taken
			Pinus mugo			05			4	80	5	0.4	0.4	
			Big Sioux Nursery, Watertown, SD			06			4	80	4	0.9	0.7	
						08			4	80	4	1.8	1.4	
1A/8/6-10	9082887	HIRH80	seaberry	20-May	04	04	PLBR	5	5	100	4	0.6	1.6	
			Hippophae rhamnoides			05			5	100	4	1.1	1.6	
			Lincoln-Oakes Nursery, Bismarck, ND			06			4	80	4	1.5	1.9	
						08			4	80	3	3.1	3.1	
1A/8/11-15	9082642	VILA	wayfaring bush	20-May	04	04	PLBR	5	5	100	5	0.9	1.3	
			Viburnum lantana			05			5	100	5	0.8	1.2	
			Lincoln-Oakes Nursery, Bismarck, ND			06			5	100	4	0.8	1.2	winter injury on 4,5
						08			5	100	5	1.3	1.4	sun scald, chlorosis on all
1A/8/16-20	9076686	CRCH	roundleaf hawthorn	20-May	04	04	PLBR	5	4	80	4	0.6	0.7	
			Crataegus chrysocarpa			05			5	100	4	0.8	0.9	
			Lincoln-Oakes Nursery, Bismarck, ND			06			5	100	5	1.0	1.4	cedar apple rust on all, wooly aphids 3
						08			5	100	5	1.7	2.2	powdery mildew
1A/9/1-5	9082891	PHOP	common ninebark	20-May	04	04	PLBR	5	5	100	3	1.3	1.6	
			Physocarpus opulifolius			05			5	100	4	2.5	1.9	
			Big Sioux Nursery, Watertown, SD			06			5	100	3	4.6	3.2	
						08			5	100	2	5.9	6.0	
1A/9/6-10	9082888	COAM3	American hazelnut	20-May	04	04	PLBR	5	4	80	4	0.7	1.1	
			Corylus americana			05			5	100	4	1.0	1.5	
			Lincoln-Oakes Nursery, Bismarck, ND			06			5	100	3	1.6	1.7	
						08			5	100		3.3	2.9	all browsed

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IA/9/11-15	'Prairie Red'	PRUNU	hybrid plum	4-May	06	06	PLBR	5	5	100	3	0.8	1.6	
	9047203		*Prunus* sp.			07			5	100	3	1.0	1.8	
			Big Sioux Nursery, Watertown, SD			08			5	100	3	1.4	1.9	all browsed
IA/9/16-20	9092053	RHTY	staghorn sumac	4-May	06	06	PLBR	5	5	100	2	3.9	3.9	
			Rhus typhina			07			5	100	4	4.5	5.1	
			Lincoln-Oakes Nursery, Bismarck, ND			08			5	100	4	5.3	4.4	deer rub on 2
IA/10/1-5	9092143	RHTY	staghorn sumac	May	07	07		5	1	20	3	1.5	1.0	
	Tiger Eyes		*Rhus typhina*			08			5	100	3	0.9	1.2	
			S&B Nursery, Bismarck, ND (Bailey's, St. Paul, MN)			09			4	80	3	1.6	1.8	
1A/10/6-10	9092141	VILE	nannyberry	May	07	07		5	5	100	3	0.5	1.6	2,3,5 powdery mildew
			Viburnum lentago			08			5	100	3	1.2	1.7	
			Schumacher's Nursery, Heron Lake, MN			09			5	100	4	0.8	1.8	powdery mildew on all
IA/10/11-15	Sun Harvest	COAM3	American hazelnut	May	07	07		5	3	60	4	0.4	1.8	
	Germplasm		*Coylus americana*			08			5	100	4	0.7	1.6	all browsed
	9083247		USDA, NRCS, PMC, Elsberry, MO			09			5	100	5	2.1	1.7	
IA/10/16-20	Midwest	PRAM	American plum	May	07	07		5	3	60	4	0.4	1.3	
	Premium Germplasm		*Prunus americana*			08			3	60	6	0.3	1.0	
	9083241		USDA, NRCS, PMC, Elsberry, MO			09			4	80	5	0.8	1.1	deer browse on all
IA/11/1-5	9082895	PRAR3	apricot	May	07	07		5	3	60	4	0.9	1.0	
			Prunus armeniaca			08			3	60	4	1.8	2.6	
			Rod O'Clair, Jamestown, ND			09			3	60	5	3.8	4.5	
			USDA, NRCS, PMC, Bismarck, ND											
IA/11/6-10	9091969	CAFR80	Russian peashrub	May	07	07		5	5	100	4	0.3	1.4	
			Caragana frutex			08			5	100	5	0.4	1.4	
			Big Sioux Nursery, Watertown, SD			09			5	100	4	0.6	1.5	
IA/11/11-15	9091964	RHTR	skunkbush sumac	May	07	07		5	5	100	2	0.9	1.8	
			Rhus trilobata			08			5	100	4	2.7	2.0	chlorosis
			Cave Hills, SD			09			5	100	4	3.8	2.4	
			USDA, NRCS, PMC, Bismarck, ND											

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IA/11/16-20	9091967	PRPE	pin cherry	8-May	08	08		5	5	100	4	0.4	1.7	all browsed
			Prunus pennsylvanica			09			4	80	4	0.8	1.6	
			Big Sioux Nursery, Watertown, SD											
II/1/1-5	'Roselow'	MASA	Sargent crabapple	1-May	96	96	PLBR	5	4	80	4	1.4	2.0	browse on 4
	PI-477986		*Malus sargentii*			97			4	80	2	2.0	2.3	
			USDA, NRCS, PMC, East Lansing, MI			98			4	80	3	3.5	3.4	
			Lincoln-Oakes Nursery, Bismarck, ND			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	
II/1/6-10	'Midwest'	MAMA37	Manchurian crabapple	1-May	96	96	PLBR	5	5	100	3	1.6	2.5	browse on 1,3
	478000		*Malus mandshurica*			97			5	100	2	3.4	3.6	
			USDA, NRCS, PMC, Bismarck, ND			98			5	100	1	5.0	6.4	
			Lincoln-Oakes Nursery, Bismarck, ND			00			5	100	3	7.8	9.1	
						02			5	100	2	9.0	10.2	
						05			5	100	3	9.8	13.3	
II/2/1-5	9030971	ACGI	amur maple	1-May	96	96	PLBR	5	5	100	3	1.1	1.8	
			Acer ginnala			97			5	100	2	1.6	1.9	
			Lincoln-Oakes Nursery, Bismarck, ND			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	
II/1/6-10	'Schubert'	PRVI	chokecherry	1-May	96	96	PLBR	5	5	100	4	0.7	2.1	
	9012608		*Prunus virginiana*			97			5	100	1	1.5	2.6	
			Lincoln-Oakes Nursery, Bismarck, ND			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	

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II/3/1-5	9047209	PRVI	chokecherry	1-May	96	96	PLBR	5	5	100	3	0.7	2.0	
			Prunus virginiana			97			5	100	3	1.5	3.5	insect damage on 4
			Lincoln-Oakes Nursery, Bismarck, ND			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
II/3/6-10	ND-1733	PRAM	plum	1-May	96	96	PLBR	5	5	100	3	1.3	2.4	
	9006060		*Prunus americana*			97			5	100	3	2.8	3.4	insect, disease damage
			Lincoln-Oakes Nursery, Bismarck, ND			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	
II/4/1-5	9034956	CEOC	hackberry	7-May	09	09		5	5	100	3	0.4	1.1	
			Celtis occidentalis											
			Polk County, MN											
			USDA, NRCS, PMC, Bismarck, ND											
II/4/6-10	Oahe	CEOC	hackberry	7-May	09	09		5	5	100	3	0.5	1.7	
			Celtis occidentalis											
			Big Sioux Nursery, Watertown, SD											
II/5/1-5	'McDermand'	PYUS	Ussurian pear	1-May	96	96	PLBR	5	5	100	3	1.0	2.5	browse on 1
	478004		*Pyrus ussuriensis*			97			5	100	3	2.4	3.3	leaf damage
			NRCS, PMC, Bismarck, ND			98			5	100	2	2.9	5.2	
			Lincoln-Oakes Nursery, Bismarck, ND			00			5	100	3	7.3	9.4	
						02			5	100	3	10.0	11.8	
						05			5	100	4	12.0	13.6	
II/5/6-10	9076733	VILE	nannyberry	1-May	96	96	PLBR	5	5	100	5	0.3	0.7	
			Viburnum lentago			97			5	100	5	0.8	1.3	
			Turtle Mountains, ND			98			5	100	3	1.3	2.9	mildew on leaves
			Lincoln-Oakes Nursery, Bismarck, ND			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

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II/6/1-5	'Homestead'	CRAN6	Arnold hawthorn	1-May	96	96	PLBR	5	5	100	5	0.5	1.5	browse on 3,5
	9005731		*Crataegus X anomala*			97			4	80	7	0.4	1.4	
			NRCS, PMC, Bismarck, ND			98			4	80	8	0.3	1.4	severe rabbit damage - all
			Lincoln-Oakes Nursery, Bismarck, ND			00			4	80	7	1.2	1.6	
						02			4	80	6	2.2	2.5	
						05			2	40	6	1.8	3.0	
II/6/6-10	9069121	PRPA	mayday	1-May	96	96	PLBR	5	5	100	5	0.4	0.6	browse on 4,5
			Prunus padus			97			5	100	4	1.1	1.7	
			Norway			98			5	100	3	1.6	3.2	insect damage on 3,4
			USDA, NRCS, PMC, Bismarck, ND			00			5	100	3	3.7	6.1	
						02			5	100	3	5.4	9.2	
						05			5	100	4	5.7	10.3	
II/7/1-5	9069129	PRMA	amur chokecherry	1-May	96	96	CONT(P)	5	5	100	1	2.2	4.1	
			Prunus maackii			97			5	100	1	4.4	5.6	
			Big Sioux Nursery, Watertown, SD			98			5	100	1	6.3	8.6	moderate deer rub
			USDA, NRCS, PMC, Bismarck, ND			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
II/7/6-10	9082666	BETUL	Asian black birch	16-May	01	01	CONT	5	5	100	3	1.0	1.3	
			Betula davurica			02			5	100	3	2.3	2.9	
			Lawyer Nursery, Plains, MT			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	
II/8/1-5	9092052	QUBI	swamp white oak	4-May	06	06	PLBR	5	4	80	3	0.6	1.2	5 chewed off
			Quercus bicolor			07			4	80	3	0.8	1.3	
			Lincoln-Oakes Nursery, Bismarck, ND			08			4	80	4	1.1	1.3	
II/8/6-10	9082675	FRMA	Manchurian ash	3-May	00	00	PLBR	5	5	100	2	0.8	2.2	
			Fraxinus mandshurica			01			5	100	4	1.2	2.3	
			Lincoln-Oakes Nursery, Bismarck, ND			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	

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II/9/1-5	9082667	BEPO	gray birch	3-May	00	00	PLBR	5	5	100	2	1.3	3.6	
			Betula populifera			01			5	100		3.7	6.4	
			Lawyer Nursery, Plains, MT			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	4-May	06	06	PLBR	5	5	100	3	0.6	0.8	
			Catalpa speciosa			07			4	80	3	0.8	1.0	
			Big Sioux Nursery, Watertown, SD			08			4	80	4	4.0	1.6	
III/1/1-5	9076739	QUERC	oak hybrid	30-Apr	98	98	CONT(P)	5	5	100	4	0.6	1.7	
			Quercus			99			4	80	6	1.2	2.4	browse on 4
			E.T. Jacobson, MN			00			4	80	3	2.4	3.9	
			USDA, NRCS, PMC, Bismarck, ND			02			4	80	5	3.9	6.2	
						04			4	80	6	4.5	7.3	acorns on 3
						07			4	80	4	6.6	8.3	
III/1/6-10	9069177	QUMA	bur oak	30-Apr	98	98	CONT(P)	5	5	100	6	0.5	1.0	browse on 3
			Quercus macrocarpa			99			4	80	6	0.8	1.2	
			E.T. Jacobson, MN			00			5	100	5	1.4	1.7	
			USDA, NRCS, PMC, Bismarck, ND			02			5	100	5	3.9	4.8	
						04			5	100	5	3.2	5.4	stem gall on 5
						07			5	100	5	4.7	6.6	
III/2/1-5	'Oahe'	CEOC	hackberry	1-May	96	96	PLBR	5	5	100	5	1.0	2.7	
	476982		*Celtis occidentalis*			97			5	100	5	1.7	2.7	4 browsed
			NRCS, PMC, Bismarck, ND			98			5	100	5	2.1	3.7	
			Lincoln-Oakes Nursery, Bismarck, ND			00			5	100	4	6.6	8.1	
						02			5	100	4	7.9	11.7	
						05			5	100	4	7.6	13.4	

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III/2/6-10	9019578	CEOC	hackberry	1-May	96	96	PLBR	5	5	100	6	0.5	1.7	browse on 2,3,5
			Celtis occidentalis			97			5	100	6	1.7	2.8	browse on 3,4,5
			Lincoln-Oakes Nursery, Bismarck, ND			98			5	100	4	2.5	3.9	
						00			5	100	4	6.2	7.1	
						02			5	100	4	10.3	13.2	leaf gall
						05			5	100	4	10.4	14.7	
III/3/1-5	'Cardan'	FRPE	green ash	1-May	96	96	PLBR	5	4	80	5	0.4	1.6	
	469226		*Fraxinus pennsylvanica*			97			5	100	3	1.4	2.2	
			NRCS, PMC, Bismarck, ND			98			5	100	4	3.0	4.1	
			Lincoln-Oakes Nursery, Bismarck, ND			00			5	100	4	7.6	8.1	
						02			5	100	4	9.4	12.4	
						05			5	100	4	10.2	14.9	
III/3/6-10	9019586	FRPE	green ash	1-May	96	96	PLBR	5	5	100	3	1.0	2.6	
			Fraxinus pennsylvanica			97			5	100	3	2.8	3.7	2 browsed
			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
			Fraxinus pennsylvanica			97			5	100	3	1.0	2.0	leaf damage on 2
			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	
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
			Fraxinus nigra			97			2	40	7	0.7	1.0	browse on 1
			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	leaves yellowing-stress

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III/5/1-5	9063127	FRAM	white ash	1-May	96	96	PLBR	5	5	100	5	0.2	1.4	
			Fraxinus americana			97			5	100	4	1.6	2.3	slight insect damage on 2
			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	
III/5/6-10	9076730	ACSA	silver maple	1-May	96	96	PLBR	5	5	100	3	1.2	3.1	
			Acer saccharinum			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
III/6/1-5	Hunter Germplasm	PIPOS	ponderosa pine	12-May	05	05		5	5	100	2	0.6	1.2	
			Pinus ponderosa var. *scopulorum*			06			5	100	2	1.2	1.6	
	9081843		USDA, ARS, Bridger, MT			07			5	100	2	2.1	2.5	
						09			5	100		4.1	4.6	
III/6/6-10	9063148	PHAM	amur corktree	1-May	96	96	CONT(P)	5	5	100	5	0.4	1.2	browse on 5
			Phellodendron amurense			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
III/7/1-5	9069178	PIRE	red pine	29-Apr	99	99		5	5	100	4	1.0	1.3	
			Pinus resinosa			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	

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III/7/6-10	9076731	QUMA	bur oak	1-May	96	96	PLBR	5	5	100	5	0.2	1.3	browse on 1,2
			Quercus macrocarpa			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; top dieback on 5
III/8/1-5	9076735	AEGL	Ohio buckeye	1-May	96	96	PLBR	5	5	100	4	0.2	0.6	
			Aesculus glabra			97			5	100	8	0.7	0.6	
			Lincoln-Oakes Nursery, Bismarck, ND			98			5	100	6	0.7	1.0	
						00			5	100	4	1.6	1.5	
						02			5	100	6	1.9	1.8	
						05			5	100	6	1.0	1.4	leaf burns/dieback on all
III/8/6-10	9076737	PRSE	black cherry	1-May	96	96	PLBR	5	4	80	3	1.0	1.9	
			Prunus serotina			97			4	80	4	1.9	2.2	
			Apple Valley FEP			98			4	80	3	4.3	5.0	
			Lincoln-Oakes Nursery, Bismarck, ND			00			4	80	3	8.7	10.1	
						02			4	80	3	11.1	12.9	
						05			4	80	4	10.8	15.1	
III/9/1-5	9082609	PICEA	Meyer's spruce	16-May	01	01	CONT	5	3	60	5	0.8	0.7	
			Picea meyeri			02			3	60		1.0	0.9	
			Itasca Greenhouse, Cohasset, MN			03			3	60		1.2	1.1	
						05			3	60	3	1.6	1.4	
						07			3	60	5	2.2	1.6	
III/9/6-10	9092236	POTR	aspen	8-May	08	08		5	1	20	4	0.5	1.8	
			Populus tremuloides			09			1	20	6	1.0	1.8	
			Big Sioux Nursery, Watertown, SD											
III/10/1-5	9082885	POTR5	aspen	20-May	04	04	PLBR	5	3	60	4	0.7	2.1	
			Populus tremuloides			05			4	80	5	1.1	1.9	
			NDFS Nursery, Towner, ND			06			5	100		1.4	2.2	
						08			5	100	4	1.8	2.2	

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III/10/6-10	9082633	FRNI	black ash	29-Apr	99	99		5	5	100	6	0.3	0.7	browse on 4
			Fraxinus nigra			00			4	80	4	0.9	1.0	
			Lawyer Nursery, Plains, MT			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	SYREP	Pekin lilac	1-May	96	96	PLBR	5	5	100	3	2.3	2.9	
	478008		*Syringa reticulata* ssp. *pekinensis*			97			4	80	5	2.4	2.3	winter damage
			Lincoln-Oakes Nursery, Bismarck, ND			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	
III/11/6-10	9076725	ULCA	smooth bark elm	1-May	96	96	PLBR	5	5	100	3	2.6	3.1	
			Ulmus carpinifolia			97			5	100	6	3.5	3.6	sev. rabbit damage 1,3,4,5
			Russia			98			5	100	3	5.1	5.6	rabbit damage on trunk 3,4
			USDA, ARS, Mandan, ND			00			5	100	4	9.0	9.1	
						02			5	100	4	12.5	13.9	
						05			5	100	4	11.4	17.2	
III/12/1-5	9082886	POTR5	aspen	20-May	04	04	PLBR	5	5	100	4	0.8	2.0	
			Populus tremuloides			05			5	100	5	1.1	2.2	
			Lincoln-Oakes Nursery, Bismarck, ND			06			4	80		1.9	2.3	
						08			3	60	4	1.6	2.3	
III/13/1-5	9082639	QUEL	northern pin oak	29-Apr	99	99	PLBR	5	2	40	8	0.3	0.5	
			Quercus ellipsoidalis			00			2	40	6	1.1	0.9	
			Lincoln-Oakes Nursery, Bismarck, ND			01			2	40	6	1.0	2.5	
						03			2	40	4	2.4	4.1	
						05			2	40	?	2.3	5.6	leaf galls, army worms/galls
						08			2	40	4	4.3	7.9	
III/14/1-5	9082739	OSVI	ironwood	May	07	07		5	2	40	4	0.9	2.1	
			Ostrya virginiana			08			5	100	6	0.4	1.0	deer browse, chlorosis on 1
			Sertoma Park, Bismarck, ND			09			5	100	6	0.7	1.1	
			USDA, NRCS, PMC, Bismarck, ND											

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III/14/6-10	9092231	PICO	lodgepole pine *Pinus contorta* var. *latifolia*	7-May	09	09		5	5	100	4	0.5	1.1	needle burn on 4
IV/1/1-5	9082610	LASI	Siberian larch	30-Apr	98	98	CONT(S)	5	5	100	4	0.5	1.0	
			Larix sibirica			99			5	100	6	0.8	1.5	
			NDFS Nursery, Towner, ND			00			5	100	5	1.3	2.1	
						02			5	100	4	3.1	5.0	
						04			5	100	5	3.9	6.9	
						07			5	100	3	6.5	11.2	
IV/1/6-10	9082611	LASI	Siberian larch	30-Apr	98	98	CONT(S)	5	5	100	3	0.5	1.2	
			Larix sibirica			99			5	100	6	0.7	1.4	
			NDFS Nursery, Towner, ND			00			5	100	5	1.0	1.6	
						02			5	100	5	1.8	2.7	
						04			5	100	5	2.4	3.7	
						07			5	100	5	3.9	6.6	
IV/2/1-5	9069168	LASI	Siberian larch	30-Apr	98	98	CONT(P)	5	1	20	4	0.3	1.3	
			Larix sibirica			99			4	80	6	0.7	1.4	
			Russia			00			4	80	5	1.1	1.9	
			USDA, NRCS, PMC, Bismarck, ND			02			4	80	4	2.6	4.0	
						04			4	80	4	3.2	6.6	
						07			4	80	2	6.8	11.9	
IV/2/6-10	9069162	LARIX	Dahurian larch	30-Apr	98	98	CONT(P)	5	3	60	3	0.9	1.7	
			Larix olgensis			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	98	CONT(P)	5	0	0				
			Larix olgensis			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	

Project No.: 38I347K Field Evaluation of Woody Plant Materials, Becker, Minnesota
Year of Record: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
IV/3/6-10	9069164	PISYM	Scots pine	30-Apr	98	98	CONT(P)	5	2	40	4	0.6	1.0	
			Pinus sylvestris var. *mongolica*			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	98	CONT(P)	5	0	0				
			Pinus sylvestris			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	

Below is the 2009 annual progress report, a stand-alone publication, for this study.

2009 Report
Off-Center Evaluation Planting of Woody Plant Materials Becker, Minnesota

Dwight Tober, Plant Materials Specialist
Rachel Bergsagel, Biological Technician
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 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 eight locations in the three-state area, including three 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). 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 identify the Anoka Sand Plain Plant Materials Evaluation and Demonstration Project. The first trees and shrubs were planted in 1996. The site was 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. The seeding was off to an excellent start and the stand looked good in the fall of 2009. Rainfall conditions were below normal early in the season. April and May received less than 2 inches of total rain compared to 6 inches which is the normal. Late summer rains were near average. New entries planted each year are flagged and hand watered. Weed control is mechanical cultivation between rows, and hand hoeing within rows. 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.

OBJECTIVES

1. 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.

There are 35 different species in the new Shrub Block 1A.

ACTIVITIES IN 2009

Approximately 111 accessions of 87 different species are currently being evaluated. Five accessions were added to the planting on May 7, 2009. They included skunkbush sumac (*Rhus trilobata*), the low growing variety 'Autumn Amber' from New Mexico; American highbush cranberry (*Viburnum opulus* var. *americanum*) from Big Sioux Nursery at Watertown, South Dakota; lodgepole pine (*Pinus contorta* var. *latifolia*) selected from a Provenance Nursery at Mandan, North Dakota; and two hackberry (*Celtis occidentalis*) accessions, Prairie Harvest, a new PMC release from Polk County, Minnesota; and 'Oahe', a PMC release from central South Dakota. All plants were potted, except for the highbush cranberry plants which were bareroot seedlings. No replacements were made for non-surviving plants from accessions planted in previous years. Weed control and plot maintenance have 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 2009. These included redleaf rose (*Rosa rubrifolia)* 9082685, and Missouri gooseberry (*Ribes missouriensis*) 9082746.

Information was collected on selected entries on August 20, 2009. 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 arrowwood, Juneberry, sand cherry, Russian almond, Pekin cotoneaster, redosier dogwood, and Indigo silky dogwood. Oahe hackberry appeared to have winter injury. Entries noted to be in high vigor and doing well included rugosa rose, American black currant, common ninebark, winterberry, 'Freedom' honeysuckle, black

A kiosk provides information for self-guided tours. Fine fescues were planted between the rows in 2009.

chokeberry, green ash species, hackberry species, black cherry, and most of the conifer species. Twenty-eight accessions/entries were measured in 2009.

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 me at (701) 530-2075 or Dwight.Tober@nd.usda.gov. The report is about 25 pages in length.

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 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. 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**
'McDermand' 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**

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.

OFF-CENTER EVALUATION PLANTING: TECHNICAL REPORT 2009

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, 33 accessions of 30 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 2004-2009.

For the 2009 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 21, 2009. 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.

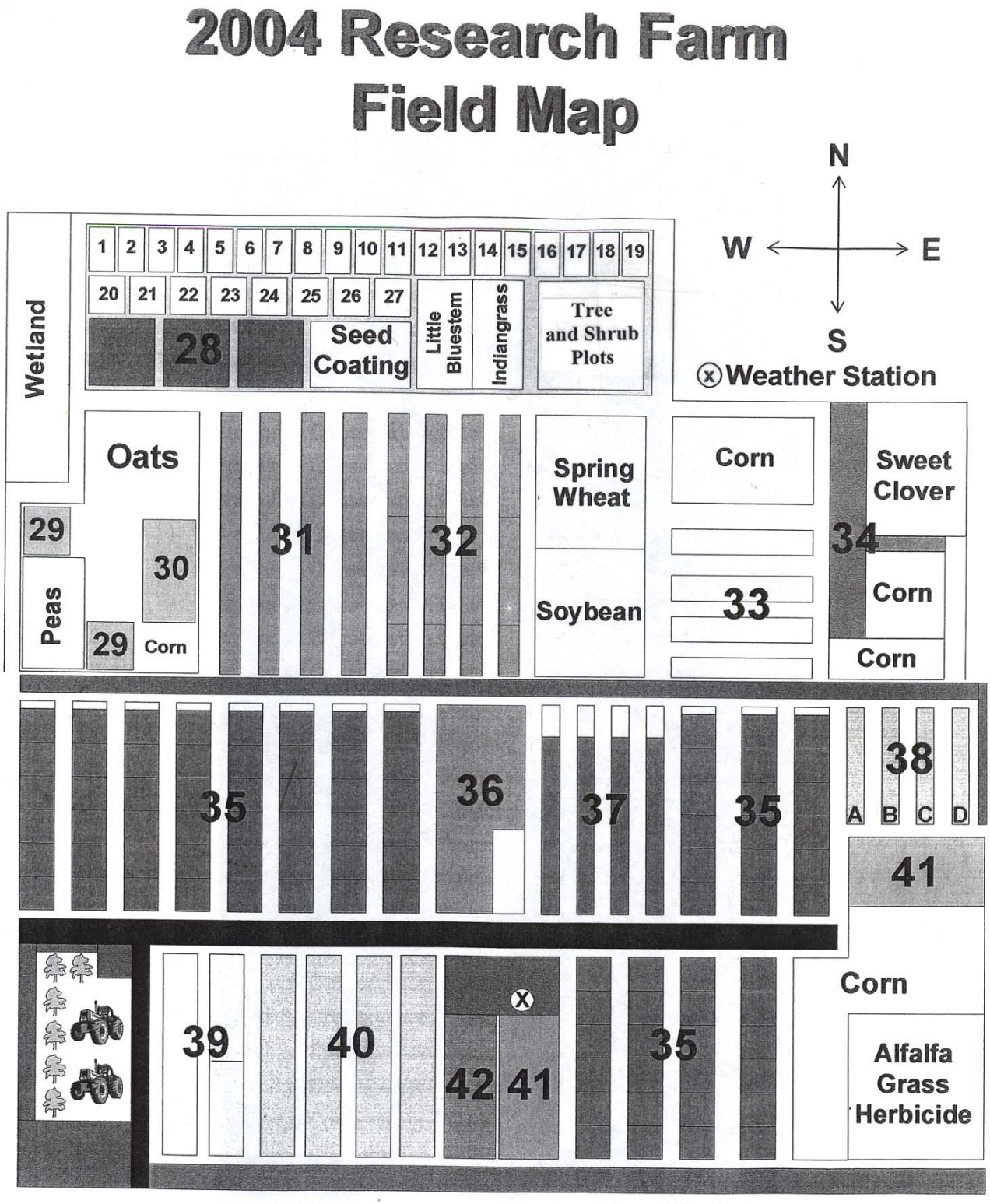
2004 Research Farm
Field Map
N
W
E
S
Weather Station
Wetland
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27
28
Seed Coating
Little Bluestem
Indiangrass
Tree and Shrub Plots
Oats
29
30
31
32
Spring Wheat
Soybean
Corn
33
Sweet Clover
34
Corn
Corn
Peas
29
Corn
35
36
37
35
38
A
B
C
D
41
Corn
39
40
42
41
35
Alfalfa
Grass
Herbicide

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 Nurse
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. common juniper (9019593), origin: Wilton Mine
3. American highbush cranberry (9094281), from Big Sioux Nursery, Watertown, SD
4. 'McKenzie' black chokeberry, 2008 release from PMC
5. Nannyberry (9092141), from Schumachers Nursery, Heron Lake, MN
6. Apricot (9082895), sweet fruit, origin: Rod O'Clair, Jamestown, ND, grown by PMC.
7. Korean mountain ash (9092140), commercial source from Big Sioux Nursery, Watertown, SD

Rows 4-8 (open space)

Medium to Tall Trees (north side)

Row 9

1. **(east end)** Juniper (Bridger-Select), from Bridger PMC, Montana. (spaded 2007)
2. Ponderosa pine (Hunter), from Bridger PMC, Montana. (spaded 2007)
3. Amur chokecherry (9082853), introduced from China. Bronze colored bark and is non-suckering. Grown by Lincoln-Oakes. (spaded 2007)
4. Black cherry (9076737), native to most of the eastern half of the U.S. Grown by Lincoln-Oakes Nurseries. (spaded 2007)
5. Aspen (8082886) native suckering species from Saskatchewan, Canada, grown by Lincoln-Oakes Nurseries. (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

revised 6/09

Table No. BR-1: 2009 Weather Summary - Official Station - Brookings, South Dakota					
	Mean Temperature (degrees Fahrenheit)		Precipitation (inches)		
			Actual		Deviation from Normal
Month	**2009**	**Normal***	**2009**	**Normal***	**2009**
January	7.1	10.9	0.61	0.34	0.27
February	17.8	17.9	0.34	0.40	-0.06
March	28.4	30.1	0.91	1.29	-0.38
April	42.0	44.2	1.09	2.03	-0.94
May	55.5	56.7	2.36	2.95	-0.59
June	63.9	66.1	3.73	4.23	-0.50
July	65.8	70.7	3.97	3.11	0.86
August	65.8	68.6	1.85	2.94	-1.09
September	62.1	59.1	1.52	2.48	-0.96
October	39.5	46.3	6.25	1.78	4.47
November	39.3	30.0	0.07	1.00	-0.93
December	12.9	16.3	0.79	0.26	0.53
Annual	**41.7**	**43.1**	**23.49**	**22.81**	**0.68**
M = missing data					
*National Climate Data Center 1971-2000 Monthly Normals					
		2009			
Last Frost (28 degrees)		28-Apr			
First Frost (28 degrees)		9-Oct			
Frost Free Period		163 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: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
S1-1	9082889	PIMU80	mugo pine	18-May	04	04	PLBR	5	4	80	5	0.9	1.1	
			Pinus mugo			05			5	100	4	1.0	0.7	replant 3
			Big Sioux Nursery, Watertown, SD			06			5	100	3	1.4	0.8	1 open form
						08			5	100	3	2.5	2.1	
S1-2	9082891	PHOP	common ninebank	18-May	04	04	PLBR	5	5	100	2	1.4	1.9	
			Physocarpus opulifolius			05			5	100	2	3.7	3.5	
			Big Sioux Nursery, Watertown, SD			06			5	100	3	5.0	5.0	1 blight on leaves, 4 good seed
						08			5	100	3	7.5	5.9	light mildew, spot
S1-3	9082642	VILA	wayfaring bush	18-May	04	04	PLBR	5	5	100	3	0.7	1.2	
			Viburnum lantana			05			5	100	3	1.3	1.7	leaf burn on all
			Lincoln-Oakes Nursery, Bismarck, ND			06			5	100	3	2.0	2.6	
						08			5	100	4	3.4	4.3	highly variable
S1-4	9082887	HIRH80	seaberry	18-May	04	04	PLBR	5	5	100	3	0.9	2.2	
			Hippophae rhamnoides			05			5	100	3	1.9	2.9	
			Lincoln-Oakes Nursery, Bismarck, ND			06			5	100	3	3.3	4.1	
						08			5	100	3	6.4	6.2	1-2 female, 3-5 male
S1-5	9082888	COAM3	American hazelnut	18-May	04	04	PLBR	5	5	100	7	0.3	0.6	1 browsed off
			Corylus americana			05			5	100	5	0.6	0.7	leaf burn on all
			Lincoln-Oakes Nursery, Bismarck, ND			06			5	100	3	1.0	1.4	
						08			5	100	4	2.0	2.5	highly variable
S1-6	9082687	RIAM	American currant	18-May	04	04	PLBR	5	5	100	2	1.2	1.8	
			Ribes americanum			05			5	100	3	4.0	2.6	mildew spot on all
			Bix Sioux Nursery, Watertown, SD			06			5	100	3	5.0	3.2	1,2 blight, leaf drop
						08			5	100	3	6.2	3.8	
S1-7	9082746	RIMI	Missouri gooseberry	18-May	04	04	PLBR	5	5	100	3	1.8	1.7	
			Ribes missouriense			05			5	100	3	3.1	2.5	red fall color on all
			Big Sioux Nursery, Watertown, SD			06			5	100	3	3.8	3.3	3-5 some leaf drop, blight
						08			5	100	4	4.5	3.7	early leaf drop

Study No.: NDPMC-T-0201-CP, Field Evaluation of Woody Plant Materials, Brookings, SD
Year of Record: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
S1-8	9082890	CORA6	gray dogwood	18-May	04	04	PLBR	5	5	100	4	0.8	1.3	3 browsed
			Cornus racemosa			05			5	100	3	1.4	1.9	leaf spot on 5
			Big Sioux Nursery, Watertown, SD			06			5	100	3	2.2	2.6	1,2,5 leaf spot
						08			5	100	4	3.8	3.9	highly variable; 4 very leafy
S1-9	9082738	CORA6	gray dogwood	18-May	04	04	PLBR	5	5	100	2	1.1	2.4	
			Cornus racemosa			05			5	100	3	1.9	2.8	leaf spot on 1 and 5
			Lincoln-Oakes Nursery, Bismarck, ND			06			5	100	2	3.4	3.8	1 bad leaf spot
						08			5	100	2	5.0	5.3	
S1-10	9076686	CRCH	roundleaf hawthorn	18-May	04	04	PLBR	5	5	100	4	0.4	0.5	heavily browsed
			Crataegus chrysocarpa			05			4	80	4	0.7	1.3	browsed
			Lincoln-Oakes Nursery, Bismarck, ND			06			5	100	5	1.0	2.0	1 white aphid
						08			5	100	4	2.3	3.9	
S1-11	9091967	PRPE2	pin cherry	10-May	05	05		5	5	100	3	2.9	2.9	5 close spacing
			Prunus pensylvanica			06			5	100	3	4.2	4.1	4,5 leaf spot
			Big Sioux Nursery, Watertown, SD			07			5	100	3	4.3	5.0	
						09			5	100	5	7.8	7.1	deer rub 1,4; 5 close spacing
S2-1	9091976	VIDE	arrowwood viburnum	10-May	05	05		5	5	100	3	0.9	2.2	1 and 4 has fruit
			Viburnum dentatum			06			5	100	3	2.2	2.6	clean leaves, no disease
			Lincoln-Oakes Nursery, Bismarck, ND			07			5	100	3	3.1	3.3	no fruit
						09			5	100	3	4.9	5.0	1 clean leaves, some fruit
S2-2	9082711	EUBU6	winterberry	10-May	05	05		5	5	100	4	0.7	1.2	
			Euonymus bungeanus			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	AMELA	serviceberry	10-May	05	05		5	5	100	4	0.9	1.9	leaves chewed on
			Amelanchier lamarckii			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	

Study No.: NDPMC-T-0201-CP, Field Evaluation of Woody Plant Materials, Brookings, SD
Year of Record: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
S2-4	9091971	PHME13	black chokeberry	10-May	05	05		5	5	100	3	1.5	2.1	fruit on all
			Photinia melanocarpa			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	
			Prunus virginiana			06			5	100	3	2.0	4.0	shot hole on all
			Lincoln-Oakes Nursery, Bismarck, ND			07			5	100	3	2.6	5.4	shot hole on all
						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	
			Caragana frutex			06			5	100	6	0.4	1.3	
			Big Sioux Nursery, Watertown, SD			07			5	100	6	0.5	1.5	deer browse on all
						09			5	100	4	1.2	2.4	1,2,5 browsed
S2-7	9019593	JUNIP	common juniper	2-May	06	06	CONT	5	5	100	3	2.6	0.8	
			Juniperus sp.			07			5	100	2	3.9	0.8	
			Wilton Mine, ND/McKenzie FEP, ND			08			5	100	2	5.8	1.5	
S2-8	9092054	ELAEA	Russian olive/silverberry hybrid	2-May	06	06	POTD	5	2	40	2	3.1	4.3	2,3,5 recently dead, canker?
	'Silverscape'		*Elaeagnus X* 'Jefmorg'			07			4	80	6	1.4	2.6	
			Lincoln-Oakes Nursery, Bismarck, ND						4	80	5	3.9	4.6	
S2-9	9092053	RHTY	staghorn sumac	2-May	06	06	PLBR	5	5	100	3	3.8	5.0	clean leaves, no disease
			Rhus typhina			07			5	100	5	4.8	6.2	
			Lincoln-Oakes Nursery, Bismarck, ND			08			5	100	3	8.9	8.9	
S2-10	9082739	OSVI	ironwood	May	07	07		5	5	100		0.7	1.4	rabbit damage 1,5
			Ostrya virginiana			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	
			Rhus trilobata			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	3 deer browse; 4 prostrate
			USDA, NRCS, PMC, Bismarck, ND											

Study No.: NDPMC-T-0201-CP, Field Evaluation of Woody Plant Materials, Brookings, SD
Year of Record: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
S3-1	'Cathedral'	ULMUS	Siberian/Japanese elm cross	May	07	07		5	5	100	4	1.6	8.6	no leaves on 1
	9092142		*Ulmus X* 'Cathedral'			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	9019593		common juniper			08		5	5	100	3	2.1	0.4	
			Juniperus communis			09			5	100	3	4.0	0.5	
			Wilton Mine, ND											
S3-3	9094281	VIOPA	American highbush cranberry	7-May	09	09		5	5	100	3	1.6	2.0	
			Viburnum opulus var. *americanum*											
			Big Sioux Nursery, Watertown, SD											
S3-4	'McKenzie'	PHME	black chokeberry			08		5	5	100	2	2.8	2.5	
	323597		*Photinia melanocarpa*			09			5	100	2	4.2	3.7	all large fruit
			USDA, NRCS, PMC, Bismarck, ND											
S3-5	'Prairie Red'		hybrid plum			08		5	5	100	3	3.6	5.1	highly variable
	9047203		*Prunus* sp.			09		5	5	100	3	4.3	6.3	
S3-6	9092141	VILE	nannyberry	May	07	07		5	5	100	2	0.5	1.4	
			Viburnum lentago			08			4	80	2	1.0	3.0	
			Schumacher's, Heron Lake, MN			09			5	100	4	2.2	3.7	
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
			Sorbus alnifolia			08			2	40		0.9	1.5	
			Big Sioux Nursery, Watertown, SD			09			2	40	6	1.9	2.3	
T1-1	9082853	PRMA9	amur chokecherry	18-May	04	04	PLBR	5	5	100	3	1.4	2.6	
			Prunus maackii			05			4	80	4	2.4	4.3	
			Lincoln-Oakes Nursery, Bismarck, ND			06			5	100	3	3.3	5.4	
				spaded		07			5	100	4	3.4	5.3	
						08			5	100	5	3.4	5.4	1 leaning

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Year of Record: 2009

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	VI	CAN COV (ft)	PLT HT (ft)	REMARKS
T1-2	9076737	PRSE2	black cherry	18-May	04	04	PLBR	5	5	100	3	1.4	2.3	
			Prunus serotina			05			5	100	4	2.4	4.1	
			Lincoln-Oakes Nursery, Bismarck, ND			06			5	100	4	4.6	5.9	
				spaded		07			5	100	6	4.0	5.3	
						08			3	60		4.5	5.8	1 leaf spot; 4 transplant shock, dead
T2-1	Bridger Select	JUSC2	Rocky Mountain juniper	10-May	05	05		5	5	100	2	0.8	1.5	good color
	9078631		*Juniperus scopulorum*			06			5	100	2	1.5	2.8	
			USDA, NRCS, Bridger, MT			07			4	80	2	1.9	3.2	
						09			4	80	4	3.1	4.5	
T2-2	Hunter Germplasm	PIPO	ponderosa pine	10-May	05	05		5	5	100	3	0.6	1.2	
	9081843		*Pinus ponderosa*			06			5	100	2	1.3	1.8	
			USDA, NRCS, Bridger, MT			07			5	100	2	1.6	2.1	
						09			5	100	3	3.1	4.2	
Row 4	9094282	CEOC	hackberrry	8-May	09	09		4	4	100	4		3.8	in Tubex
			Celtis occidentalis											
			South Dakota source											
			Big Sioux Nursery, Watertown, SD											
Row 4	'Oahe'	CEOC	hackberrry	8-May	09	09		5	5	100	3		3.0	in Tubex
			Celtis occidentalis											
			Big Sioux Nursery, Watertown, SD											
Row 4	Prairie Harvest Germplasm	CEOC	hackberrry	8-May	09	09		5	5	100	3		3.5	in Tubex
	9034956		*Celtis occidentalis*											
	ND-3878		Polk County, MN											

Below is the 2009 annual progress report, a stand-alone publication, for this study.

2009 Report
Off-Center Evaluation Planting of Woody Plant Materials Brookings, South Dakota

Dwight Tober, Plant Materials Specialist
Rachel Bergsagel, Biological Technician
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 six 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 bromegrass 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 added. 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 for shrubs and an area for medium to tall trees. Measurements and notes are taken at the end of each growing season. Rainfall for the year was close to the long-term normal, although spring and summer monthly totals were below average. October rainfall of 6.24 inches was more than 4 inches above the monthly normal and made for a wet fall.

OBJECTIVES

1. Conduct evaluation studies to determine the potential adaptation and performance of new and/or previously untested 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.
5. Promote evaluation site for tours and other educational purposes.

New entries were planted on May 8, 2009. Some plants had animal damage which occurred over winter.

ACTIVITIES IN 2009

Approximately 34 accessions of 24 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.

Four new entries were added on May 8, 2009. They included American highbush cranberry (*Viburnum opulus* var. *americanum*), and three sources of hackberry (*Celtis occidentalis*). The hackberry included Prairie Harvest germplasm from Polk County, Minnesota; a source from Hughes County, South Dakota; and 'Oahe' from Potter County, South Dakota. The potted hackberry seedlings were planted east of the test plots in an area where the Conservation District maintains a tree and shrub planting. The hackberry plants were protected from animal damage by 5-foot tubes. An inventory was taken and the planting plan was updated. Animal damage was noted on some entries. Staghorn sumac and 'Cathedral' hybrid elm had injury. Missing stakes were noted and will be replaced.

NRCS field office and state office staff helped collect data on selected entries on August 20, 2009. 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. The trees that were moved with the tree spade were looking better. Information was collected on 22 accession/entries in 2008. 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 me at (701) 530-2075, or the NRCS field office at Brookings, (605) 692-8003. The report is about eight pages in length.

NEW RELEASES

Data collected from this site will be used to support the formal cooperative release of new woody plant materials from the Bismarck PMC.

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.

Common ninebark is a Midwest native species. The plants were grown by Big Sioux Nursery with seed originating from Iowa. It has performed well at Brookings and is being offered for field planting evaluation in 2010.

Helping People Help the Land

OFF-CENTER EVALUATION PLANTING: TECHNICAL REPORT 2009

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: 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. Replacements 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 repellant was sprayed on all the trees after replanting. Table LP-2 is 2009 data collected at the Hebron site; Table LP-3 is 2009 data collected at the Hettinger site; Table LP-4 is 2008 data collected at Angostura State Park before deer damage; and Table LP-5 is 2009 data collected on replants after extensive deer damage had killed most of the original trees.

Table LP-2. Non-replicated Conservation Field Trial planted in 2008 near Hebron, North Dakota.

Data was collected on September 23, 2009.

Accession No.	Plant No.	Survival	Vigor (1 = highest 9=poorest)	Height (ft)	Remarks
70	1	x	3	1	
	2	x	3	1.5	
	3	x	3	1	
	4	x	3	1.5	
	5	x	3	1	
105	1	x	4	0.75	
	2	x	4	0.75	
	3	x	3	0.75	
	4	x	3	1	
	5	x	5	0.5	browsed
PP	1	x	3	1.75	
	2	x	3	1	
	3	x	3	1	
	4	x	4	1	
	5	x	3	1.25	
107	1	x	4	1.75	browsed
	2	x	3	1.75	
	3	x	3	1.25	
	4	x	5	1	
	5	x	4	1.5	
MP-158	1	x	3	1.25	
	2	x	3	1.25	
	3	x	2	1.75	
	4	x	2	1.75	
	5	x	2	1.75	
109	1	x	3	1.5	
	2	x	2	1.5	
	3	x	4	0.75	
	4	dead	-	-	
	5	dead	-	-	
	6	x	3	1	
	7	x	3	0.75	
	8	x	3	1.5	
	9	x	4	1	
	10	x	4	1	
1(10)	1	x	4	1.75	
	2	x	4	1.75	
	3	x	2	1.75	browsed
	4	x	3	1.5	
	5	x	4	0.75	

Table LP-3. Replicated Conservation Field Trial planted in 2008 near Hettinger, North Dakota. Data was collected on September 23, 2009.

Accession No.	Plant No.	Survival	Vigor (1 = highest 9=poorest)	Height (ft)	Remarks
Rep 1					
70	1	x	3	1.25	
	2	x	4	1.25	
	3	x	NA	1.25	30% brown needles
105	1	x	3	1.25	
	2	x	3	1.5	good growth
	3	x	3	1.25	good growth
108	1	x	4	1.25	
	2	x	2	1.4	good growth
	3	x	5	1	stressed
PP	1	x	5	1	
	2	x	2	2	
	3	x	3	1.5	
107	1	x	2	1.75	good growth
	2	x	3	1.25	
	3	x	3	1.5	
MP-718	1	x	3	1.5	
	2	x	3	1.5	
	3	x	3	1.5	
109	1	x	3	1.5	
	2	x	3	1.5	
	3	x	4	1.5	exposed roots
1 (10)	1	x	4	1.25	
	2	x	2	1.75	
	3	x	4	1.25	
Rep 2					
70	1	x	3	1.5	
	2	x	2	1.75	
	3	x	3	1.5	
105	1	x	2	2	
	2	x	3	1.5	
	3	x	4	1.25	yellowish
108	1	x	4	1.25	bud gone
	2	x	4	1.5	
	3	x	4	1.25	
PP	1	x	4	1.5	
	2	x	4	1.5	
	3	x	3	1.5	
107	1	x	3	2	
	2	x	3	1.5	
	3	x	4	1.25	
MP-718	1	x	3	1.25	
	2	x	3	1.5	
	3	x	4	1.25	
109	1	x	3	1.5	

Accession No.	Plant No.	Survival	Vigor (1 = highest 9=poorest)	Height (ft)	Remarks
	2	x	2	1.75	
	3	x	4	1.25	
1 (10)	1	x	3	2	
	2	x	4	1.5	
	3	x	3	1.5	
Rep 3					
70	1	x	4	1.25	dense Russian thistle
	2	x	3	1.5	dense Russian thistle
	3	x	4	1.25	dense Russian thistle
105	1	x	4	1.25	dense Russian thistle
	2	x	4	1.25	dense Russian thistle
	3	x	4	1	dense Russian thistle
108	1	x	4	1	dense Russian thistle
	2	x	3	1.75	dense Russian thistle
	3	x	4	1.25	dense Russian thistle
PP	1	x	4	1.25	dense Russian thistle
	2	x	4	1.5	dense Russian thistle
	3	x	5	1	dense Russian thistle
107	1	x	3	1.75	dense Russian thistle
	2	x	2	2.25	dense Russian thistle
	3	x	3	1.5	dense Russian thistle
MP-718	1	x	2	1.75	dense Russian thistle
	2	x	2	1.75	dense Russian thistle
	3	x	3	1.5	dense Russian thistle
109	1	x	5	0.75	dense Russian thistle
	2	x	4	1	dense Russian thistle
	3	x	4	1.25	dense Russian thistle
1 (10)	1	x	6	1	dense Russian thistle
	2	x	7	0.5	dense Russian thistle
	3	x	5	1.5	
Rep 4					
70	1	x	6	1	
	2	x	4	1	
	3	x	4	1.25	
105	1	x	3	1.5	
	2	x	2	2	
	3	x	3	1.5	
108	1	x	5	1	
	2	x	5	1.25	
	3	x	5	1.25	
PP	1	x	6	0.75	
	2	x	6	1	
	3	x	4	1	
107	1	x	3	1.5	
	2	x	3	1.75	dense Russian thistle
	3	x	3	1.75	dense Russian thistle
MP-718	1	x	4	1.5	dense Russian thistle

Accession No.	Plant No.	Survival	Vigor (1 = highest 9=poorest)	Height (ft)	Remarks
	2	x	6	1.25	dense Russian thistle
	3	x	5	1.5	dense Russian thistle
109	1	x	4	1.25	dense Russian thistle
	2	x	3	1.5	dense Russian thistle
	3	x	4	1.25	dense Russian thistle
1 (10)	1	x	3	1.75	dense Russian thistle
	2	x	4	1.5	dense Russian thistle
	3	x	5	1.25	dense Russian thistle
Rep 5					
70	1	x	6	1.25	brown needles
	2	x	6	1.25	no bud
	3	x	6	1.5	dense Russian thistle
105	1	x	6	1.5	dense Russian thistle
	2	x	5	2	brown needles
	3	x	5	1.5	dense Russian thistle
108	1	x	8	0.5	dense Russian thistle
	2	dead	-	-	dense Russian thistle
	3	x	7	1.25	dense Russian thistle
PP	1	x	4	1.5	dense Russian thistle
	2	x	4	1.25	dense Russian thistle
	3	x	4	1.25	dense Russian thistle
107	1	dead	-	-	dense Russian thistle
	2	x	4	1.25	dense Russian thistle
	3	x	3	1.75	dense Russian thistle
MP-718	1	x	2	2	dense Russian thistle
	2	x	2	2	dense Russian thistle
	3	x	2	2	dense Russian thistle
109	1	x	3	1.5	dense Russian thistle
	2	x	4	1.75	dense Russian thistle
	3	x	5	1	
1 (10)	1	x	4	1.5	
	2	x	3	1.25	
	3	x	2	1.75	

Table LP-4. Replicated Conservation Field Trial planted in 2008 at Angustora State Park near Hot Springs, South Dakota. Data was collected on October 31, 2008.

Accession No.	Plant No.	Survival	Vigor (1 = highest 9=poorest)	Height (ft)	Remarks
Rep 1					
70	1	dead	-	0.75	dead needles
	2	x	6	1	
	3	x	8	0.75	
105	1	dead	-	-	
	2	x	7	1	
	3	dead	-	-	
108	1	x	5	1	
	2	dead	-	-	
	3	x	4	1	
PP	1	x	4	1.25	
	2	x	3	1.25	
	3	x	3	1.25	
107	1	x	5	1.25	
	2	x	5	1.25	needles at top only
	3	x	5	1.25	needles at top only
MP-718	1	x	3	1.25	
	2	x	3	1	
	3	x	3	1	
109	1	x	4	1.5	
	2	x	7	1	leader browsed
	3	dead	-	-	
1 (10)	1	x	6	1	
	2	x	7	0.75	
	3	x	8	1	
Rep 2					
70	1	x	7	1	
	2	x	8	1	
	3	x	8	1	
105	1	dead	-	-	
	2	dead	-	-	
	3	dead	-	-	
108	1	x	5	0.75	
	2	x	6	0.75	
	3	x	6	1	
PP	1	x	2	1.5	
	2	x	3	1	
	3	x	3	1	
107	1	x	4	1.25	
	2	x	5	1.5	needles on top only
	3	x	6	1.25	
MP-718	1	x	4	1.25	
	2	x	4	1.25	
	3	x	5	1	

Accession No.	Plant No.	Survival	Vigor (1 = highest 9=poorest)	Height (ft)	Remarks
109	1	x	6	1	
	2	dead	-	-	
	3	x	9	0.75	
1 (10)	1	x	6	0.75	
	2	x	5	1.5	needles on top only
	3	dead	-	-	
Rep 3					
70	1	x	9	0.5	
	2	x	5	0.75	
	3	x	6	1	
105	1	dead	-	-	
	2	dead	-	-	
	3	dead	-	-	
108	1	x	5	0.75	
	2	x	3	0.75	
	3	dead	-	-	
PP	1	x	3	1.25	
	2	x	4	1	
	3	x	3	1	
107	1	dead	-	-	
	2	x	8	1	pulled out partially
	3	dead	-	-	
MP-718	1	x	3	1	
	2	x	2	1.25	
	3	x	2	1.25	
109	1	x	4	1	
	2	x	6	1.5	
	3	dead	-	-	
1 (10)	1	x	4	1.25	
	2	dead	-	-	
	3	x	4	1	
Rep 4					
70	1	x	5	1	
	2	dead	-	-	
	3	x	5	1	
105	1	x	6	1.75	
	2	x	6	0.75	
	3	x	6	1	
108	1	x	9	0.5	
	2	dead	-	-	
	3	dead	-	-	
PP	1	x	2	1.25	
	2	x	3	1	
	3	x	3	1	
107	1	x	4	1.25	
	2	x	6	1	

Accession No.	Plant No.	Survival	Vigor (1 = highest 9=poorest)	Height (ft)	Remarks
	3	x	5	1.25	
MP-718	1	x	4	1.25	
	2	x	4	1.75	leader browsed
	3	x	3	1	
109	1	x	6	1.25	
	2	x	6	1	
	3	dead	-	-	
1 (10)	1	x	7	1	
	2	x	9	1	
	3	dead	-	-	
Rep 5					
70	1	x	5	1	
	2	x	6	1	
	3	x	6	1	
105	1	x	3	0.75	
	2	dead	-	-	
	3	dead	-	-	
108	1	x	4	1	
	2	x	3	0.75	
	3	x	3	0.75	
PP	1	x	4	1	
	2	x	4	1.25	
	3	x	4	1.25	
107	1	x	7	1.25	
	2	x	8	1	
	3	dead	-	-	
MP-718	1	x	3	1	
	2	x	3	1.25	
	3	x	3	1.5	
109	1	x	6	0.75	
	2	x	7	1	
	3	dead	-	-	
1 (10)	1	x	7	1	
	2	dead	-	-	
	3	x	6	1.25	

Table LP-5. Replicated Conservation Field Trial planted in 2008 at Angustora State Park near Hot Springs, South Dakota. Data was collected on October 13, 2009. Most entries were replanted 5/6/09 because of deer damage. Plants not replaced will be marked *. Replications four and five were replanted to ponderosa pine are not included in this table.

Accession No.	Plant No.	Survival	Vigor (1 = highest 9=poorest)	Height (ft)	Remarks
Rep 1					
70	1	x	4	1	short, brown needles
	2	x	3	1	
	3	x	4	1.25	yellow, long needles
105	1	x	4	1	
	2	x	3	1	
	3	x	2	1	
108	1	x	3	1	yellow but full
	2	x	4	0.75	short green needled
	3	dead	-	-	
PP	1	x	3	1.25	laid over but alive
	2	x	4	1	double leader
	3*	x	2	1	
107	1	dead	-	-	
	2	x	2	1.5	
	3	dead	-	-	
MP-718	1	x	3	1.5	
	2*	x	4	0.5	one branch not chewed
	3*	x	4	1.25	
109	1	dead	-	-	
	2	dead	-	-	
	3	x	2	1.75	
1 (10)	1	x	2	2	
	2	x	2	1.5	
	3	x	3	1.5	
Rep 2					
70	1	x	3	1	
	2	x	2	1	
	3	dead	-	-	
105	1	x	3	1	
	2	dead	-	-	
	3	dead	-	-	
108	1	x	3	1.25	
	2	x	2	1	
	3	x	3	1	
PP	1	x	3	1	
	2	x	3	1.25	
	3	x	3	1	
107	1	dead	-	-	
	2	dead	-	-	
	3	x	2	1.25	
MP-718	1	x	3	1.5	

Accession No.	Plant No.	Survival	Vigor (1 = highest 9=poorest)	Height (ft)	Remarks
	2	x	3	1.5	
	3*	x	4	0.75	
109	1	x	3	2	
	2	x	3	1.5	
	3	x	3	1.25	
1 (10)	1	x	2	2	
	2	x	2	1.25	
	3	x	2	1.5	
Rep 3					
70	1	x	3	1	
	2	x	3	1	
	3	x	3	0.75	
105	1	dead	-	-	
	2	dead	-	-	
	3	x	3	0.75	
108	1	x	3	1	
	2	x	3	1	
	3	x	4	0.5	
PP	1*	x	4	1	
	2	x	5	1	
	3*	x	4	1	
107	1	x	2	1	
	2	x	2	1	
	3	x	3	1	
MP-718	1	x	3	1. 5	
	2*	x	4	1.5	
	3*	x	4	1	
109	1	x	5	1.5	very yellow
	2	x	3	1.5	
	3	x	3	1.75	
1 (10)	1	x	4	1.5	all yellow
	2	x	3	1.75	
	3	x	4	1	

ASSEMBLY AND INITIAL EVALUATION

Major Seed Source Studies and Assemblies

MAJOR SEED SOURCE STUDIES AND ASSEMBLIES: TECHNICAL REPORT – 2009

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.

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 green-house	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

SELECTION AND INCREASE

SELECTION AND INCREASE: TECHNICAL REPORT – 2009

Promising Woody Plant Material

The following accessions show potential for further evaluation:

Accession Number	Genus/species	Origin/source
ND-428 9005970	black walnut *Juglans nigra*	NDSU, Fargo, ND
ND-500 9005977	Siberian larch *Larix sibirica*	Res. Sta., Morden, MB, Canada
ND-1030 9005657	Ohio buckeye *Aesculus glabra*	Murray Co., MN
SD-13 9005888	green ash *Fraxinus pennsylvanica*	Potter Co., SD
SD-156 9005890	green ash *Fraxinus pennsylvanica*	Deuel Co., SD
ND-647 9005887	black ash *Fraxinus nigra*	Res. Sta., Morden, MB, Canada
ND-630 9006096	bur oak *Quercus macrocarpa*	Barnes Co., ND
Mich-768 9012606	horizontal juniper *Juniperus horizontalis*	USDA-NRCS, PMC, East Lansing, MI
ND-21 9034900	nannyberry *Viburnum lentago*	USDA, ARS, Mandan, ND
Dart's Golden 9019601	dwarf ninebark *Physocarpus opulifolius*	P.I. Station, Ames, IA
ND-170 9005728	cotoneaster *Cotoneaster integerrimus*	Kingsbury Co., SD
9076737	black cherry *Prunus serotina*	Faribault and Anoka Counties, MN

SELECTION AND INCREASE: TECHNICAL REPORT – 2009

Final Evaluation and Release Schedule

Genus/Species:	***Ribes americanum***
Common Name:	**American black currant**
Accession/PI Number:	**9082687**
Source:	Native collection by Big Sioux Nursery staff along the Big Sioux River near Watertown, South Dakota
Outstanding characteristics:	Excellent establishment, vigorous growth, disease and insect resistance, excellent fruit production, attractive fall color
Anticipated Release Cooperators:	North Dakota, South Dakota, and Minnesota Agricultural Experiment Stations and the South Dakota Association of Conservation Districts
Intended Use:	Wildlife and recreational plantings, farmstead windbreaks, and agroforestry applications such as fruit orchards

Genus/Species:	***Crataegus chrysocarpa***
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

Prairie Harvest Hackberry

SELECTED CLASS OF NATURAL GERMPLASM

by the
UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

and the
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

and the
MINNESOTA
AGRICULTURAL EXPERIMENT STATION

and the
NORTH DAKOTA
AGRICULTURAL EXPERIMENT STATION

The United States Department of Agriculture, Natural Resources Conservation Service; United States Department of Agriculture, Agricultural Research Service; Minnesota Agricultural Experiment Station; and North Dakota Agricultural Experiment Station announce the naming and release of a seed propagated selected class natural germplasm of common hackberry, *Celtis occidentalis* L.

As a selected class pre-varietal release, this plant will be referred to as **Prairie Harvest Germplasm hackberry**. There has been no genetic manipulation and it is considered to be a "natural" track release. Accession number 9034956 (ND-3878) was assigned to the original seed collection. This alternative release procedure is justified because there are no dependably winterhardy northern source improved releases commercially available that are adapted for conservation use in this region.

Prairie Harvest Germplasm hackberry is released for use as a native species in windbreak plantings, riparian area plantings, wildlife plantings, ornamental/recreational plantings, and other conservation uses. It is a northern source seed propagated release expected to exhibit genetic diversity to broaden its area of adaptation to various site conditions and climatic extremes. Hackberry is promoted as an alternative choice tree species to add diversity in conservation plantings and decrease the high numbers of green ash (*Fraxinus pennsylvanica*) currently being planted. Green ash is being threatened by the emerald ash borer (*Agrilus planipennis*).

Collection Site Information: Seed was collected in October of 1982 from two mature hackberry trees growing in a wooded oxbow of the Red Lake River. The seed was collected by James Ayen, District Conservationist at the Soil Conservation Service field office in Crookston, Minnesota. The site is located in Polk County in northwestern Minnesota on land owned by Roger Wagner and family. It is approximately 3 miles west of the town of Fisher. The legal description is NE ¼, Section 7, T150N, R48W. A total of 1,082 grams of fruit was hand harvested. Clean seed yield was 484 grams.

The landscape of the site is described as wooded alluvial land with occasional flooding. The soil texture is variable silts and clays. Associated tree species are eastern cottonwood, bur oak, basswood, American elm, willow, green ash, and boxelder. Associated shrub species included chokecherry, plum, hawthorn, juneberry, false indigo, snowberry, and dogwood.

The Major Land Resource Area (MLRA) is 56 – Red River Valley of the North. Nearly all MLRA 56 is in farms and ranches, and about 80 percent is non-irrigated cropland. Major crops are sugar beets, corn, potatoes, spring wheat, and soybeans. Nearly 10 percent of the area in the northeast is wooded. This nearly level glacial plain is bordered on the east by outwash, gravelly beaches, and dunes. Most of the soils are Aquolls. They are deep, somewhat poorly drained and poorly drained, and sandy to clayey, and have a frigid temperature regime. Average annual precipitation is 18-22 inches. More than half of the precipitation falls during the growing season. Precipitation in winter is snow. The average annual temperature is 34 to 45 degrees F. The average freeze-free period is 105 to 135 days.

Description: Common hackberry is a large tree, 40 to 80 feet in height at maturity. It is native to the United States and occurs from Maine to North Dakota, Colorado, Wyoming, and south to Texas and Georgia. It is noted that in the Upper Midwest hackberry is neither common nor anywhere abundant (Rosendahl 1955). Although it is primarily a bottomland species, it is also found within upland communities depending on moisture conditions, on slopes, bluffs, and rocky hillsides. It is known to grow well in deep shade. Seedlings are often found beneath heavy canopies where other species cannot survive. Common hackberry can also survive long periods of drought due to its deep tap root. It will not occur on sites with a permanently high water table, but mature trees can survive periods of excessive flooding. Hackberry is not tolerant of salts or soils with a pH much greater than 8 (Wennerberg 2004). Growth can exceed more than one foot per year on good moisture sites. The USDA hardiness zones of common hackberry are 2 through 9.

The leaves are alternate, simple, with 3 principal veins. They are ovate to ovate-lanceolate, coarsely serrated, and 2 to 5 inches long and 1 to 3 inches wide. Young leaves are covered with long matted hairs. Mature leaves are darker green above and paler beneath. Flowers are small, greenish-yellow and emerge in April and May with the leaves. Fruits are small pea-sized greenish drupes that change to dark red or black upon maturity in September and October. Hackberry fall foliage is an attractive yellow. The trunk bark is deeply furrowed with corky ridges (Stephens 1973).

The growth form for Prairie Harvest Germplasm hackberry is generally single stemmed and upright with evenly spreading branches. This is a seed propagated cultivar and diversity in types and forms can be expected. Seed production has been rated as good, although local weather patterns and moisture conditions are a major influence. Hackberry is the only known host for the hackberry nipple gall psyllid (*Pachypsylla celtidismamma*). This insect-caused condition is unsightly, but generally does not affect plant performance. Prairie Harvest Germplasm has exhibited fewer problems with nipple gall than other hackberry seed sources. Common hackberry is the host plant for numerous pollinators including the hackberry butterfly (*Asterocampa celtis*), snout butterfly

(*Libytheana carinenta*), tawny emperor (*Asterocampa clyton*), mourning cloak (*Nymphalis antiopa*), and the eastern comma (*Polygonia comma*).

Hackberry seedlings sometimes exhibit dormancy when planted in the spring. The seedlings may not leaf out until later in the year, which causes severe stress on the young plants and may result in death. Sweating prior to planting will help overcome the dormancy problem, and help improve plant survival (Knudson 2007).

Method of Selection: The original seed collection was part of a large windbreak tree research project sponsored by the Great Plains Agricultural Council, called the GP-13 Provenance Test of Hackberry. Seed was collected throughout the prairie states and provinces from Manitoba to Oklahoma. Seed was planted from 186 accessions, or seed sources, in the field at Oakes, North Dakota, in October 1988, in cooperation with Lincoln-Oakes Nurseries. In October 1989, approximately 28,000 trees were lifted. The seedlings were graded and sorted into lots for the 15 test sites planted in the spring of 1990. One of these test sites was located on property leased from the Nelson Estate by the USDA Agricultural Research Service (ARS), Northern Great Plains Research Laboratory at Mandan, North Dakota. The site is located 4.4 miles southwest of Mandan. The Provenance Test site consists of 180 accessions, five replications, with four-tree plots. 'Oahe' hackberry is a seed propagated cultivar released in 1982 for conservation use by the Natural Resources Conservation Service (NRCS) and ARS. The origin is from a native stand in central South Dakota. Oahe is the only recommended hackberry cultivar in this region and was used as the standard of comparison in this study. It is not consistently winterhardy in North Dakota or the northern half of Minnesota.

Initial survival and establishment were good. Deer and rabbit browse was severe the first several years of establishment, and resulted in a multi-stemmed growth habit for most of the entries. Data was collected in 1994 (Table 1), 2005 (Table 2), and 2007. Height measurements were collected in 1994 at year five of the planting and are recorded in Table 1. Taller northern accessions that were doing well in the study were compared to Prairie Harvest Germplasm and Oahe. Prairie Harvest Germplasm was taller than the other four accessions in three out of four replications. Overall average height, 3.3 ft, was greater than the other four accessions of 3.0 ft, 2.9 ft, 2.3 ft, and 2.2 ft. It was significantly taller (P=.05) than the accession from Barnes County and one of the Oahe sources. Selected accessions of the higher rated northern sources were again measured in 2005, and compared to Oahe and Prairie Harvest Germplasm as listed in Table 2. Form was also rated at this time as a function of plant vigor, number of stems, and lack of die-back. Lower numerical values indicated better form ratings. Total average height at 16 years of age was 22.6 ft for Prairie Harvest Germplasm. This is a 20 percent increase in height compared to an average of the two Oahe accessions. Prairie Harvest Germplasm at 16 years of age was significantly taller (P=.05) than all other accessions measured except ND-3829 from Cass County. Plant form rating was more consistent among the selected accessions, although Prairie Harvest Germplasm had the best average rating of 4.0 compared to the poorest rating which was 5.4 for one of the Oahe accessions. One hundred selected accessions were measured for total height in 2007 (Iddrisu 2007). The tallest accession measured was Prairie Harvest at 25.2 ft. The next tallest accession was 23.8 ft. The two Oahe accessions averaged 18.8 ft. Prairie Harvest Germplasm had a 25 percent increase in total average height compared to Oahe at 16 years of age.

Ecological Considerations: Common hackberry is native to the United States and is considered a desirable species where tall tree cover is a management objective. Hackberry is tap rooted and does not spread vegetatively. The small seeds are used by numerous bird species and may be spread off-site. Small mammals also consume the fruit. No off-site movement of the species was observed at the evaluation location, and invasiveness was not a problem.

Common hackberry is considered an “ice cream” species for deer and rabbits to browse. This is probably the most limiting factor in establishment of the species. Tree protectors or animal repellants should be used when planting hackberry in areas of high deer or rabbit populations. Prairie Harvest Germplasm hackberry is documented as “OK to Release” when rated through the worksheet for “Environmental Evaluation of Plant Material Releases.”

Conservation Use: The primary conservation use of Prairie Harvest Germplasm hackberry is as a northern seed source for farmstead and field windbreaks, riparian area plantings, and in wildlife habitat and recreational plantings. The hardiness and longevity of this tall tree species make it an excellent alternative species to green ash. Common hackberry provides good cover and habitat for species such as deer, upland games birds, small non-game birds, and small mammals.

Potential Area of Adaptation: This northern seed source has performed well as documented in a replicated trial in central North Dakota compared to 179 other accessions over an eighteen year period. There were no signs of winter injury or tip die-back. The primary area of adaptation targeted for Prairie Harvest Germplasm is North Dakota and the northern half of Minnesota on soils/sites recommended for the species, as referenced in the North Dakota and Minnesota NRCS Field Office Technical Guide. Secondary adaptation is anticipated to be across the regions of the Upper Midwest and Northern Great Plains. The best plant performance for hackberry has generally been on Conservation Tree and Shrub Groups 1, 3, 4, and 5. Timely and consistent weed control improves overall plant performance.

Availability of Plant Materials: Small 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 Prairie Harvest Germplasm hackberry. Seed for nursery seedling production will also be made available in limited quantities until seed is available elsewhere. It is anticipated various conservation nurseries in the region will have conservation grade bareroot seedlings and smaller potted stock available in quantity for commercial sale beginning in 2010 or 2011. Limited numbers of larger stock are currently available.

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Prepared by: Dwight A. Tober, Plant Materials Specialist, USDA-NRCS, P. O. Box 1458, Bismarck, North Dakota 58502; and Michael J. Knudson, Forester, USDA-NRCS Plant Materials Center, 3308 University Drive, Bismarck, North Dakota 58504.

Approvals for the release of Prairie Harvest Germplasm hackberry (*Celtis occidentalis* L.):

National Program Leader - Plant Materials — 9/10/09

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

8/11/09

Deputy Administrator — Date
United States Department of Agriculture
Agricultural Research Service
Washington, D.C.

8/3/09

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

6-25-09

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

7-6-09

Director — Date
United States Department of Agriculture
Agricultural Research Service
Mandan, North Dakota

8-4-09

Director — Date
University of Minnesota
Agricultural Experiment Station
St. Paul, Minnesota

7/27/09

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

Table 1. Selected hackberry height comparisons measured in feet from the Provenance Evaluation Planting at Mandan, ND. Planted in 1990 and measured in 1994.

Replication	Tree Plot	ND-3782 (Oahe)	ND-3783 (Oahe)	ND-3829 (Cass Co.)	ND-3834 (Barnes Co.)	Prairie Harvest (Polk Co.)
1	1	2.3	1.8	3.3	1.5	**2.8**
	2	missing	2.3	1.9	2.5	**1.5**
	3	2.8	2.3	2.1	2.8	**2.0**
	4	2.5	1.9	2.7	2.1	**3.1**
	Average	2.5	2.1	2.5	2.2	**2.3**
2	1	2.1	3.0	2.1	2.8	**3.2**
	2	1.8	1.8	1.5	2.5	**2.8**
	3	2.5	2.1	2.6	2.0	**2.5**
	4	2.9	1.6	3.0	2.0	**3.3**
	Average	2.3	2.1	2.3	2.3	**2.9**
3	1	3.1	2.7	2.7	2.1	**2.1**
	2	3.0	3.1	2.5	3.1	**3.4**
	3	2.8	2.0	2.8	2.4	**3.5**
	4	2.5	2.2	2.9	1.6	**3.1**
	Average	2.9	2.5	2.7	2.3	**3.0**
4	1	3.7	2.7	4.3	3.2	**4.4**
	2	4.0	2.6	3.6	2.5	**5.3**
	3	4.5	1.6	5.0	1.2	**4.6**
	4	4.4	2.2	4.2	2.2	**4.8**
	Average	4.1	2.3	4.3	2.3	**4.8**
Replication Average		**3.0ab**	**2.2b**	**2.9ab**	**2.3b**	**3.3a**

Statistical Analysis: LSD All-Pairwise Comparisons Test of averages for accessions. Means with the same letter are not significantly different (P=.05).

Table 2. Selected hackberry comparisons from the Provenance Evaluation Planting at Mandan, ND. Height is measured in feet. Form is a functional rating of vigor, number of stems, and lack of die-back. (1 = best; 9 = poorest). Planted in 1990 and evaluated in 2005.

		REP 1		REP 2		REP 3		REP 4	
Accession	Tree Plot	Height	Form	Height	Form	Height	Form	Height	Form
Prairie Harvest	1	21.7	4.0	24.5	2.0	20.0	5.0	22.7	4.0
(Polk Co.)	2	19.5	3.0	24.0	5.0	25.2	4.0	28.0	4.0
	3	18.2	4.0	20.7	3.0	23.0	4.0	26.5	3.0
	4	21.7	4.0	24.7	4.0	17.5	6.0	24.2	5.0
Rep. Average		20.3	3.8	23.5	3.5	21.4	4.8	25.4	4.0
Acc. Average		**22.6**	**4.0**						
ND-3782	1	17.0	5.0	19.0	5.0	20.0	6.0	16.5	6.0
(Oahe)	2	16.5	3.0	17.5	4.0	19.0	5.0	21.2	5.0
	3	missing	missing	17.0	5.0	19.0	3.0	19.0	7.0
	4	20.0	5.0	18.2	5.0	18.0	5.0	17.5	3.0
Rep. Average		17.8	4.3	17.9	4.8	19.0	4.8	18.6	5.3
Acc. Average		**18.3**	**4.8**						
ND-3783	1	19.5	6.0	19.0	7.0	12.7	5.0	20.7	5.0
(Oahe)	2	17.5	5.0	19.0	4.0	14.0	6.0	missing	missing
	3	21.5	6.0	19.0	5.0	18.0	6.0	17.0	6.0
	4	17.0	3.0	18.5	6.0	17.5	5.0	21.7	6.0
Rep. Average		18.9	5.0	18.9	5.5	15.6	5.5	19.8	5.7
Acc. Average		**18.3**	**5.4**						
ND-3829	1	21.2	5.0	20.5	4.0	20.0	4.0	23.5	5.0
(Cass Co.)	2	19.0	3.0	19.0	4.0	21.5	3.0	25.0	6.0
	3	21.0	5.0	20.2	4.0	22.2	5.0	24.0	5.0
	4	21.7	4.0	21.6	4.0	22.5	5.0	25.0	6.0
Rep. Average		20.7	4.3	20.3	4.0	21.6	4.3	24.4	5.5
Acc. Average		**21.8**	**4.5**						

Accession	Tree Plot	Height	Form	Height	Form	Height	Form	Height	Form
ND-3834	1	21.5	3.0	21.0	4.0	20.5	5.0	21.0	5.0
(Barnes Co.)	2	19.0	3.0	19.5	5.0	20.5	5.0	19.7	5.0
	3	19.5	3.0	20.0	4.0	16.7	4.0	19.7	6.0
	4	21.7	4.0	20.0	4.0	18.0	7.0	20.0	3.0
Rep. Average		20.4	3.3	20.1	4.3	18.9	5.3	20.1	4.8
Acc. Average		**19.9**	**4.4**						
ND-3837	1	17.0	3.0	18.8	5.0	very	NA	15.0	5.0
(Benson Co.)	2	15.5	6.0	18.0	5.0	short	NA	17.0	5.0
	3	14.0	6.0	18.5	6.0		NA	17.7	5.0
	4	17.0	5.0	20.0	6.0		NA	16.5	5.0
Rep. Average		15.9	5.0	18.8	5.5	NA	NA	16.6	5.0
Acc. Average		**17.1**	**5.2**						
ND-3854	1	20.7	5.0	17.5	4.0	16.7	4.0	17.5	6.0
(Ramsey Co.)	2	18.0	4.0	19.0	5.0	21.0	4.0	17.5	5.0
	3	19.0	4.0	19.5	5.0	20.0	5.0	19.7	5.0
	4	19.0	5.0	16.5	6.0	17.0	6.0	18.7	5.0
Rep. Average		19.2	4.5	18.1	5.0	18.7	4.8	18.4	5.3
Acc. Average		**18.6**	**4.9**						

SUMMARY

	Height	Form
Prairie Harvest	**22.6a**	**4.0d**
ND-3782 (Oahe)	18.3cd	4.8bc
ND-3783 (Oahe)	18.3cd	5.4a
ND-3829 (Cass Co.)	21.8ab	4.5cd
ND-3834 (Barnes Co.)	19.9bc	4.4cd
ND-3837 (Benson Co.)	17.1d	5.3ab
ND-3854 (Ramsey Co.)	18.0cd	4.8abc

Statistical Analysis: LSD All-Pairwise Comparisons Test of averages for accessions. Means with the same letter are not significantly different (P=.05).